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The report documents the approach and results of work performed for a state-wide emission inventory. The objective of the project was to support the state of Minnesota Pollution Control Agency in the collection, processing and reporting of emission source data for sulfur oxides, particulates, nitrogen oxides, hydrocarbons, and carbon monoxide emissions. The purpose of the project was to provide the State of Minnesota with input information for the preparation of Implementation Plans. Information was obtained from questionnaires, publications, and personal correspondence.

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AIR POLLUTANT EMISSION INVENTORY
STATE OF MINNESOTA
AIR QUALITY DIVISION

EPA Contract 68-02-0047

Task Order No. 1

Performed for Region V
Environmental Protection Agency
and
Minnesota Pollution Control Agency

Report 4280
October 1971

Program Manager
Dr. R. R. Hippler

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APPENDIX: Emissions Inventory Summaries

1.0 INTRODUCTION

This report documents the approach and the results of the work performed for the State-wide Emission Inventory for Minnesota, Environmental Protection Agency, Contract 68-02-0047, Task Order Number 1.

The objective of the project was to support the State of Minnesota Pollution Control Agency in the collection, processing and reporting of emission source data for five air pollutants -- sulfur oxide, particulates, nitrogen oxides, hydrocarbons, and carbon monoxide emissions.

The purpose of the project is to provide the State of Minnesota with input information for the preparation of Implementation Plans, as called for under the Clean Air Act of 1970, and with data useful for the enforcement activities of the Pollution Control Agency.

The project began on March 29, 1971, and ended September 8, 1971. The work began with preparation of letters and questionnaires to institutional, commercial and industrial establishments. Additional mailings to grain handling establishments, municipalities and power plants were prepared and delivered to Minnesota under the project work. Total questionnaires mailed reached 1200.

Information was obtained from publications and personal correspondence listed in Table 1.1. The procedure followed closely that of Bierbaum.[1] The procedure is discussed in Section 3.0.

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[1]Bierbaum, P. J., Gedgaudas, M. J., Air Pollutant Emission Inventory Techniques, U. S. Dept. of H.E.W., Public Health Service Draft.

Table 1.1

REFERENCE MATERIAL FOR
MINNESOTA EMISSION INVENTORY

1. Laws and Regulations for Minnesota Pollution Control Agency

2. List of Electric Utilities with capacity and fuel type.

3. List of population and area by county, 1960.

4. 1970 Census of Population, U.S. Dept. of Commerce, Bureau of the Census, P.C. (VI)-25, Minnesota.

5. 1970 Census of Housing, HC (VI)-25, Minnesota.

6. 1967 Census of Manufacturers, U.S. Dept. of Commerce, Bureau of the Census, MC 67 (P)-1.

7. Minnesota Agricultural Statistics, 1969, U.S. Dept. of Agriculture, Minnesota Dept. of Agriculture, March, 1969.

8. United States Census of Population, 1960, Minnesota, U.S. Dept. of Commerce, Bureau of the Census PC (1) 25B.

9. 1963 Census of Business, Selected Services, Minnesota, U.S. Dept. of Commerce, Bureau of the Census, BC63-SA25.

10. 1963 Census of Manufacturers, Minnesota, U.S. Dept. of Commerce, Bureau of the Census, MC63 (3)-24.

11. County Business Patterns, Minnesota, CBP-67-25, U.S. Dept. of Commerce, Bureau of the Census.

12. 1963 Census of Business, Wholesale Trade, Minnesota, U.S. Dept. of Commerce, Bureau of the Census, BC63-WAZS.

13. 1960 Census of Housing, HC (1)-No. 25, Minnesota, U.S. Dept. of Commerce, Bureau of the Census.

14. 1963 Census of the Business, Retail Trade, Minnesota, BC 63-RA 15, U.S. Dept. of Commerce, Bureau of the Census.

15. Census tracts, Minneapolis-St. Paul, U.S. Dept. of Commerce, Bureau of the Census, PHC (1)-93.

16. 1964 United States Census of Agriculture, Vol. 1, Part 15, Minnesota, U.S. Dept. of Commerce, Bureau of the Census.

17. Study and Investigation of Solid Waste Control for the Minnesota Pollution Control Agency, Phase 11 Final Report, Henningson, Durham and Richardson, February 1969.

Table 1.1 (Continued)

REFERENCE MATERIAL FOR
MINNESOTA EMISSION INVENTORY

18. State Plan for Solid Waste Management for the State of Minnesota, Minnesota Pollution Control Agency, March 1970.

19. Solid Waste Management Procedures and Administrative Guidelines, Metropolitan Council, July 1970.

20. Summary of Clay County Land Disposal Site Investigations, Minnesota Pollution Control Agency, September 22, 1969.

21. Dept. of Taxation, Product Receipts (Fuels).

22. Summary of 1970 Motor Vehicle Registration.

23. Data sheets on electric utility fuel use for 1968 from steam electric factors, National Coal Association.

24. 1970 Annual Yearbook, Complete and Official Statistics on Petroleum Industry for 1969, Minnesota and North Dakota, Northwest Petroleum Association.

25. Fargo-Moorhead Air Pollutant Emission Inventory, USD HEW, NAPCA, March 1970.

26. City of St. Paul Air Quality Survey, Progress Report No. 9, February 1, 1970, Division of Air Pollution Control, St. Paul, Minn.

27. Statewide Study of Air Pollution for the Minnesota Pollution Control Agency, H.J. Paulus, U. of Minn., February, 1969.

28. Air Pollutant Emission Factors, Preliminary Document, EPA, April 1971.

29. Air Pollution Emissions Inventory for the City of Duluth, Minnesota, For the Year 1967, St. Louis County Health Dept.

30. Various maps, documents, and data sheets on census tracts, traffic counts, and other data.

31. Air Pollution Report, Federal Facilities, Metropolitan Minneapolis, St. Paul Interstate Air Quality Control Region, EPA, APCO, February 1971.

32. Bituminous Coal and Lignite Distribution, Calendar Year 1970, Mineral Industry Surveys, U.S. Dept. of Interior, Bureau of Mines, March 23, 1971.

2.0 DESCRIPTION

In this section topography, demography and meteorology are described to present the general physical characteristics of the regions and the State.

2.1 Minnesota

Figure 2.1 is a map of Minnesota, showing county boundaries and AQCR boundaries. Fargo-Moorhead AQCR, Duluth-Superior AQCR, and Winona-LaCrosse AQCR are interstate regions. The remaining regions are intrastate regions.

2.1.1 General Characteristics

Minnesota is a north-central State bounded on the north by the Canadian provinces of Manitoba and Ontario, on the east by Wisconsin and Lake Superior, on the south by Iowa, and on the west by the Dakotas. It has an area of 84,068 square miles, of which 4,059 square miles are water. It ranks twelfth in area in the nation. The small extension of the State known as the "Northwest Angle", lying north of the forty-ninth parallel, is the northernmost portion of the United States, except for Alaska.

2.1.2 Topography

Minnesota offers a variety in surface features, but with gently rolling hills. The flattest portion of the State is in the Red River Valley, a large prairie land. This area was part of the bed of the Glacial Lake Agassiz. The roughest terrain is in the Arrowhead Country, a region of volcanic formations and iron bearing rocks, the remains of mountains eroded by the glaciers. In the southeastern part of the State are deep erosion valleys along the Mississippi River and its tributaries. There are found bluffs three to six

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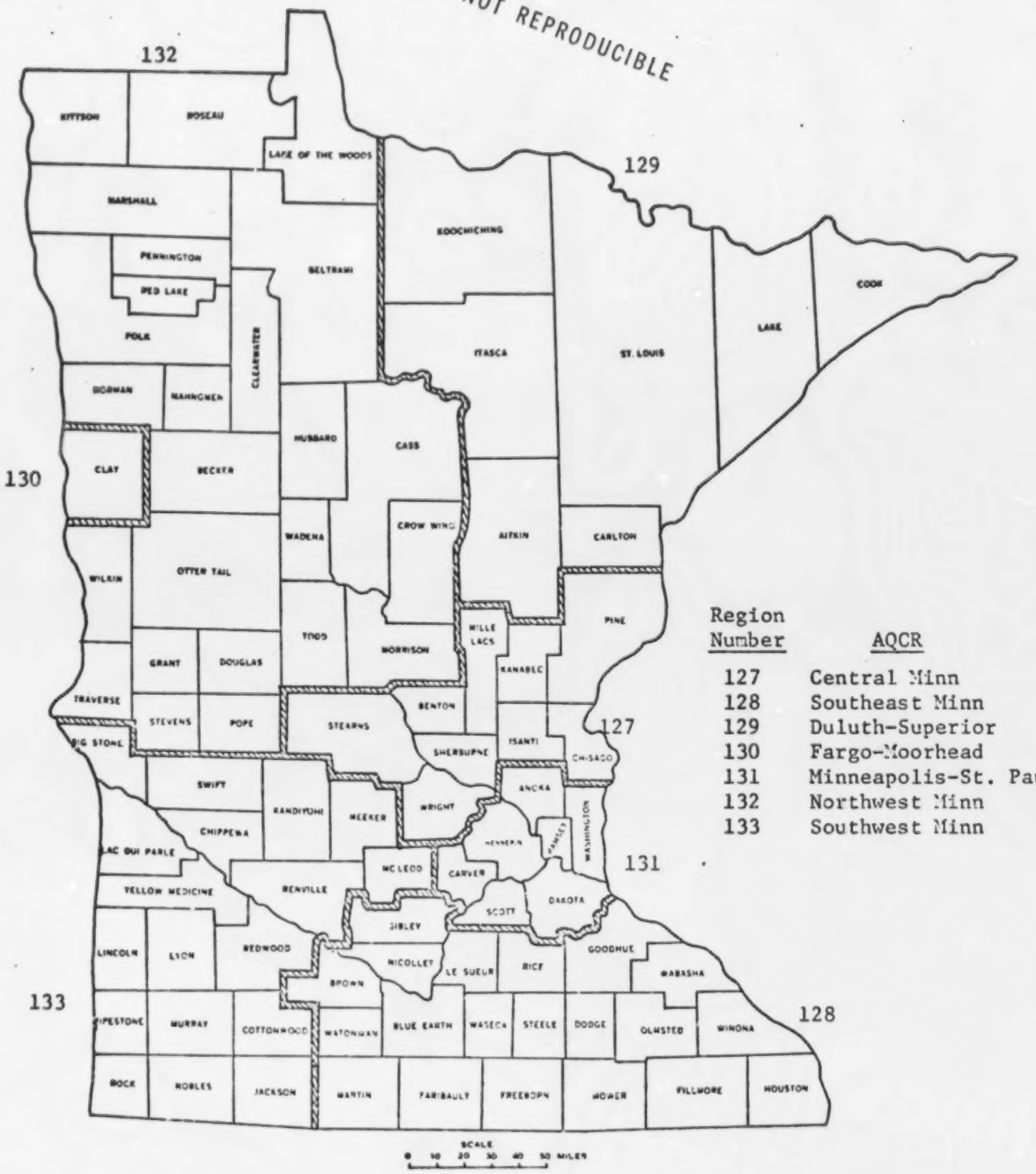

Region Number	AQCR
127	Central Minn
128	Southeast Minn
129	Duluth-Superior
130	Fargo-Moorhead
131	Minneapolis-St. Paul
132	Northwest Minn
133	Southwest Minn

Figure 2.1 Minnesota Counties and Air Quality Control Regions

hundred feet high.

Altitude in the State ranges from 602 above sea level, the level of Lake Superior, to 2,230 feet in the Misquah Hills north of the Lake. Other high points are in the Coteau des Prairies and in Leaf Hills in the west central part of the State, which rise to about 1700 feet. The Sawtooth Range bordering northwest Lake Superior is further topographic relief. The average elevation of Minnesota is 1200 feet.

Minnesota contains the sources of three great river systems, one flowing north to Hudson Bay, one east to the Atlantic and one south to the Gulf of Mexico. Fifty seven percent of the State is drained by the Mississippi River, whose headwaters are in Itasca State Park in northern Minnesota. About thirty four percent is drained by the Hudson Bay-Nelson River system through the Red River of the North and the Rainy River. The Great Lakes-St. Lawrence system drains about nine percent of the water, through the St. Louis River, the Pigeon River and other rivers flowing into Lake Superior. Two large rivers, the Minnesota and the St. Croix, are tributaries to the Mississippi.

Figure 2.2 shows the geologic surface features and Figure 2.3 shows the topographic relief for Minnesota.

2.1.3 Demography

Minnesota has a population of 3,770,007 persons, according to the 1970 census, about a 9.6 percent increase over 1960. The trend of the population has been away from rural Minnesota toward the urban areas. Forty eight counties outside the Twin Cities metropolitan area had a decline in population over the last decade. Table 2.1 shows the 1960 and 1970 population figures by

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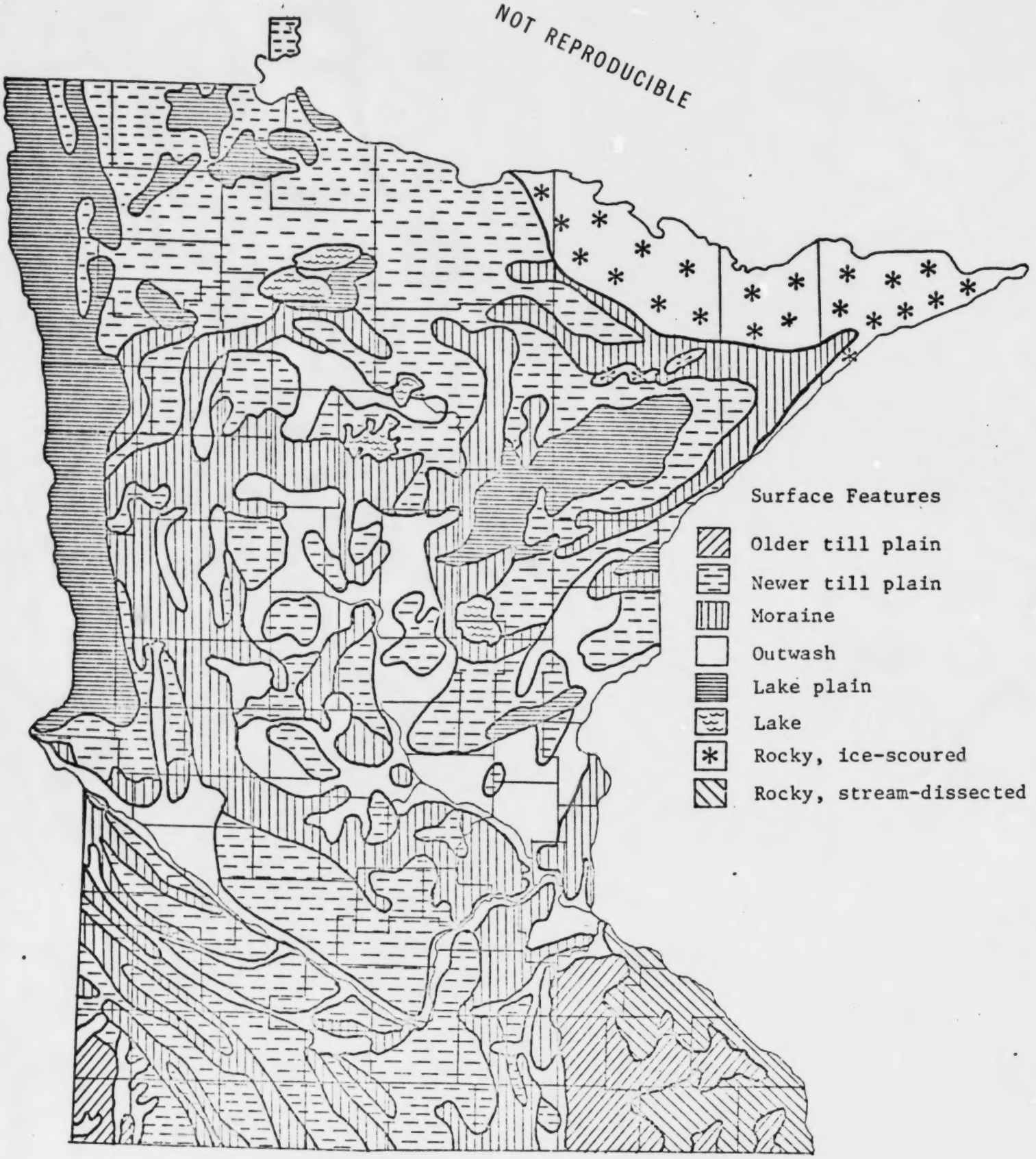

Figure 2.2 Surface Features for Minnesota

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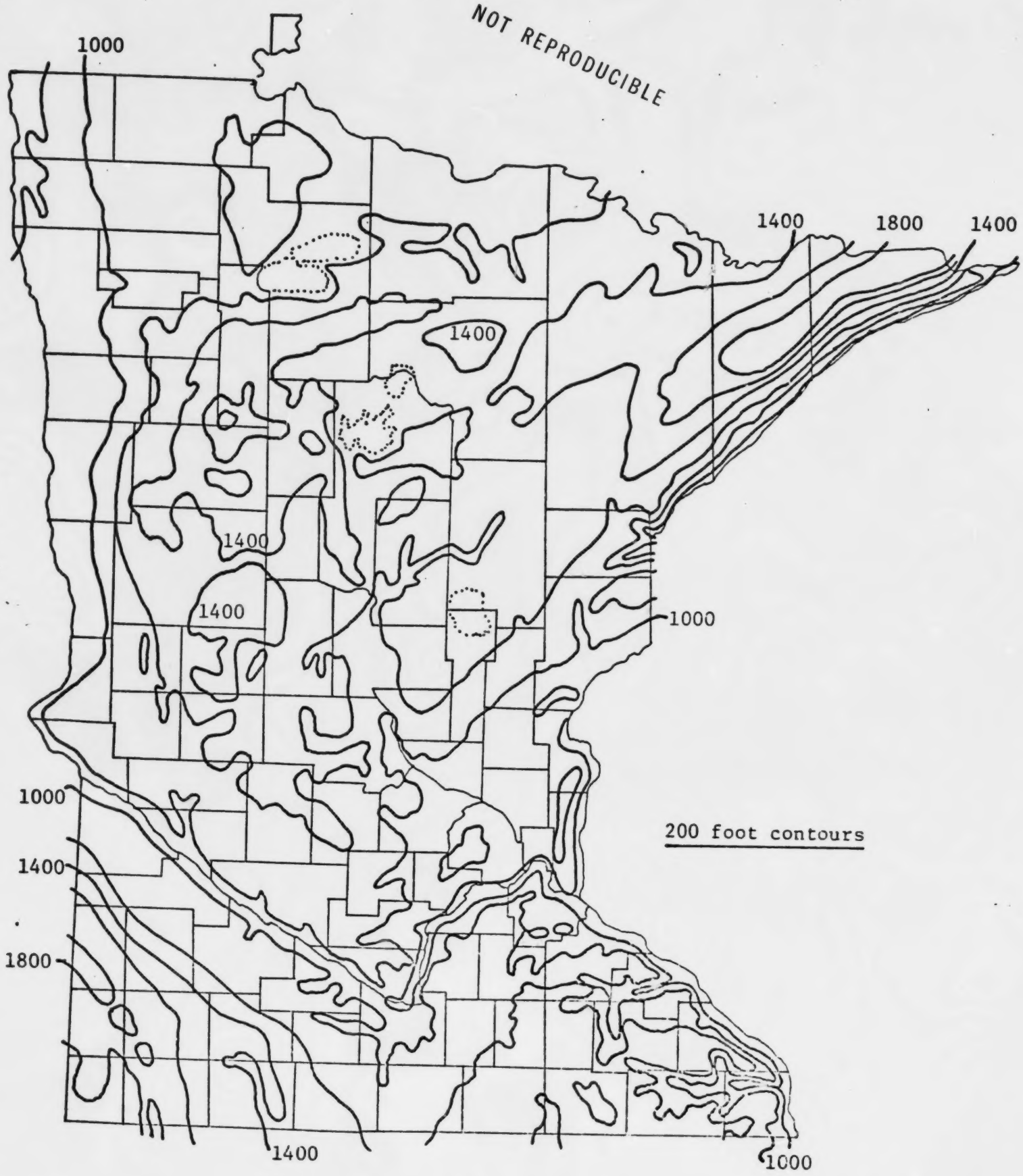

Figure 2.3 Topographic Relief (simplified) for Minnesota

Table 2.1

POPULATION, AREA AND POPULATION DENSITY FOR MINNESOTA BY COUNTY

COUNTY	1970 Population	1960 Population	Land Area (Sq.Mi.)	Population per sq.mi.
Aitkin	11,031	12,162	1,831	6
Anoka	153,562	85,916	424	362
Becker	23,509	23,959	1,297	18
Beltrami	25,754	23,425	2,507	10
Benton	20,721	17,287	402	51
Big Stone	8,020	8,954	490	16
Blue Earth	52,456	44,385	737	71
Brown	28,621	27,676	610	47
Carlton	27,677	27,932	862	31
Carver	28,102	21,358	359	78
Cass	16,495	16,720	1,998	8
Chippewa	14,649	16,320	582	25
Chisago	17,340	13,419	419	41
Clay	45,474	39,080	1,045	44
Clearwater	7,888	8,864	1,000	8
Cook	3,346	3,377	1,346	2
Cottonwood	14,814	16,166	636	23
Crow Wing	33,815	32,134	995	34
Dakota	138,613	78,303	576	241
Dodge	12,946	13,259	435	30
Douglas	22,614	21,313	647	35
Faribault	20,833	23,685	711	29
Fillmore	21,650	23,768	859	25
Freeborn	37,625	37,891	700	54
Goodhue	34,241	33,035	753	46
Grant	7,733	8,870	546	14
Hennepin	955,617	842,854	567	1,685
Houston	17,396	16,588	555	31
Hubbard	10,169	9,962	932	11
Isanti	16,283	13,530	438	37
Itasca	35,011	38,006	2,633	13
Jackson	14,172	15,501	696	20
Kanabec	9,656	9,007	524	18
Kandiyohi	29,991	29,987	783	38
Kittson	6,785	8,343	1,123	6
Koochiching	16,819	18,190	3,127	5
Lac qui Parie	11,031	13,330	768	14
Lake	12,869	13,702	2,062	6
Lake of the Woods	3,819	4,304	1,311	3
Le Sueur	21,259	19,906	440	48
Lincoln	9,150	9,651	531	17

Table 2.1 (Continued)

POPULATION, AREA AND POPULATION DENSITY FOR MINNESOTA BY COUNTY

COUNTY	1970 Population	1960 Population	Land Area (Sq. Mi.)	Population per sq.mi.
Lyon	24,092	22,655	709	34
McLeod	27,404	24,401	488	56
Mahnomen	5,563	6,341	563	10
Marshall	12,792	14,262	1,789	7
Martin	24,098	26,986	703	34
Meeker	18,367	18,887	619	30
Mille Lacs	15,180	14,560	571	27
Morrison	26,848	26,641	1,127	24
Mower	43,065	48,498	703	61
Murray	12,366	14,743	703	18
Nicollet	24,378	23,196	432	56
Nobles	22,958	23,365	712	32
Norman	9,888	11,253	885	11
Olmsted	81,258	65,532	656	124
Otter Tail	45,859	48,960	1,962	23
Pennington	13,207	12,468	622	21
Pine	16,606	17,004	1,414	12
Pipestone	12,665	13,605	464	27
Polk	33,861	36,182	2,013	17
Pope	11,023	11,914	669	17
Ramsey	474,799	422,525	155	3,063
Red Lake	5,277	5,830	432	12
Redwood	19,730	21,718	874	23
Renville	20,709	23,249	979	21
Rice	40,856	38,988	496	82
Rock	11,212	11,864	485	23
Roseau	11,241	12,154	1,676	7
St. Louis	218,528	231,588	6,092	36
Scott	32,148	21,909	353	91
Sherburne	17,765	12,861	430	42
Sibley	15,732	16,228	583	27
Stearns	93,985	80,345	1,342	70
Steele	26,600	25,029	425	63
Stevens	12,707	11,262	553	23
Swift	12,996	14,936	739	18
Todd	21,523	23,119	942	23
Traverse	6,307	7,503	568	11
Wabasha	17,134	17,007	522	33
Wadena	12,398	12,199	536	23
Waseca	16,492	16,041	415	40
Washington	82,437	52,432	386	214
Watonwan	13,258	14,460	433	31
Wilkin	9,251	10,650	752	12

Table 2.1 (Continued)

POPULATION, AREA AND POPULATION DENSITY FOR MINNESOTA BY COUNTY

COUNTY	1970 Population	1960 Population	Land Area (Sq.Mi.)	Population per sq.mi.
Winona	43,462	40,937	752	58
Wright	38,251	29,935	674	57
Yellow Medicine	14,184	15,523	753	19
Total	3,770,007	3,413,864	79,278	47

87 Counties

Table 2.2

Population of 92 Largest Communities in Minnesota

COMMUNITY	1960 Population	1970 Population
Minneapolis	482,872	431,977
St.Paul	313,411	308,686
Duluth	106,884	99,761
Bloomington	50,498	81,761
Rochester	40,663	51,568
St.Louis Park	43,410	48,812
Richfield	42,523	47,215
Edina	28,501	44,039
St.Cloud	33,815	39,555
Minnetonka	25,037	35,480
Brooklyn Center	24,356	34,717
Roseville	23,997	34,472
Mankato	23,797	30,968
Crystal	24,283	30,564
Coon Rapids	14,931	30,225
Moorhead	22,934	29,026
Fridley	15,173	28,993
Winona	24,895	26,036
Brooklyn Park	10,197	25,979
Maplewood	18,519	25,279
South St. Paul	22,032	24,895
Austin	27,908	24,831
Golden Valley	14,559	24,189
Columbia Heights	17,533	23,789
New Hope	3,552	23,087
White Bear Lake	12,849	22,795
Blaine	7,570	20,492
Burnsville	10,721(1965)	19,813
New Brighton	6,448	19,384
Albert Lea	17,108	19,212
West St.Paul	13,101	18,554
Plymouth	9,576	17,985
Robbinsdale	16,381	16,948
Faribault	16,926	16,459
Hibbing	17,731	16,069
Owatonna	13,409	15,213
Anoka	10,562	13,545
Hopkins	11,370	13,395
Cottage Grove	4,850	13,338
New Ulm	11,114	12,908
Willmar	10,417	12,833
Fergus Falls	13,733	12,731
Virginia	14,034	12,291
Hastings	8,965	12,026
Inver Grove Heights	Not available	12,022
North St.Paul	8,520	12,001

Table 2.2 (Continued)

Population of 92 Largest Communities in Minnesota

COMMUNITY	1960 Population	1970 Population
Brainerd	12,898	11,421
Bemidji	9,958	11,398
Shoreview	7,157	10,835
Fairmont	9,745	10,679
Eagan Township	3,382	10,263
Red Wing	10,528	10,191
Northfield	8,707	10,123
Stillwater	8,310	10,110
Mounds View	6,416	9,946
Marshall	6,681	9,850
Worthington	9,015	9,733
St. Anthony	5,084	9,708
Thief River Falls	7,151	8,648
Cloquet	9,013	8,640
Apple Valley	585	8,392
St. Peter	8,484	8,271
Crookston	8,546	8,221
Hutchinson	6,207	7,790
Little Falls	7,551	7,556
East Grand Forks	6,998	7,555
Lakeville	924	7,516
Mound	5,440	7,462
North Mankato	5,927	7,372
Oakdale	Not available	7,318
Grand Rapids	7,265	7,122
Alexandria	6,713	6,905
Shakopee	5,201	6,815
Orono	5,643	6,741
Waseca	5,898	6,686
Herman Twp. (St.Louis Co.)	5,192	6,644
St. Cloud Twp.(Stearns Co.)	4,347	6,409
Spring Lake Park	3,260	6,398
International Falls	6,778	6,332
Mendota Heights	5,028	6,115
Chisholm	7,144	5,836
Marion Twp.(Olmsted Co.)		5,824
White Bear Two.	6,175	5,762
Detroit Lakes	5,633	5,676
Arden Hills	3,930	5,662
Falcon Heights	5,927	5,659
St. Paul Park	3,267	5,567
Montevideo	5,693	5,435
Litchfield	5,078	5,306
Pipestone	5,324	5,274
Morris	4,199	5,120
Sauk Rapids	4,038	5,027

county. The population for ninety-two of the largest communities is shown in Table 2.2. Comparing these two tables, one can note the trend toward the suburbs. Minneapolis decreased in population from 1960 to 1970, and yet Hennepin County increased in total population. The average number of persons per square mile in Minnesota is about 45, compared to a national average of about 55.

In spite of the move to urban and suburban areas, many of the people in Minnesota are farmers and farm workers. The percentages are approximately 23% farmers and farm laborers, 20% clerical and sales workers, 14% operative and kindred workers, 13% craftsmen and foremen, 9% domestic and service workers, 9% managers, proprietors and officials, 8% professional and technical workers and 4% laborers excluding farms and mines.

2.2 Regional Characteristics

Minnesota is divided into seven AQCR's. Table 2.3 lists the Regions and categorizes each Region by EPA priority for each pollutant. The highest priority Region is the Minneapolis-St. Paul Intrastate AQCR. Further details on this AQCR are discussed in the following sections.

2.3 Minneapolis-St. Paul AQCR

2.3.1 General

The seven counties in the MSPAQCR include Hennepin, Ramsey, Anoka, Washington, Dakota, Scott and Carver. These counties cover about 2,900 square miles in an area around the confluence of the Minnesota and Mississippi Rivers.

Table 2.3

EPA PRIORITIES BY POLLUTANT AND REGION

Air Quality Control Region and Number		SO_2	PART.	CO	NO_x	O_x
Central Minn.	127	III	II	III	III	III
Southeast Minn.	128	IA	II	III	III	III
Duluth	129	II	I	III	III	III
Fargo-Moorhead	130	III	II	III	III	III
Mpls.-St. Paul	131	I	I	I	I	I
Northwest Minn.	132	III	II	III	III	III
Southwest Minn.	133	III	III	III	III	III

Pollutant		Priority I Greater Than	II From-To	III Less Than
Sulfur Oxides	Annual Arithmetic Mean	100	60-100	60
	24 Hour Maximum	455	260-455	260
	3 Hour Maximum			1300
Particulates	Annual Geometric Mean	95	60- 95	60
	24 Hour Maximum	325	150-325	150

The Minneapolis-St. Paul Region is a metropolitan area rather well developed for industry and commerce in Hennepin and Ramsey Counties, with lesser development in Anoka and Dakota and minimal development in the remaining three counties. There are six power plants in the region. Manufacturing employment density is shown in Figure 2.4.[2]

2.3.2 Topographical Features

The region is located in the confluence of the Minnesota and Mississippi Rivers, scoured by glaciers into a generally low-lying and level surface. Most of the region is moraine with some outwash areas occurring, especially in Anoka County.

2.3.3 Demography

The demography of the Minneapolis-St. Paul Region is metropolitan in character. Except for Carver County and the slightly more dense population of Scott County, the Metro area density is significantly greater than the State average, with the surrounding counties significantly below the State average.

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[2]Report for Consulation on the Minneapolis-St.Paul Air Quality Central Region, USDHEW, April 1969.

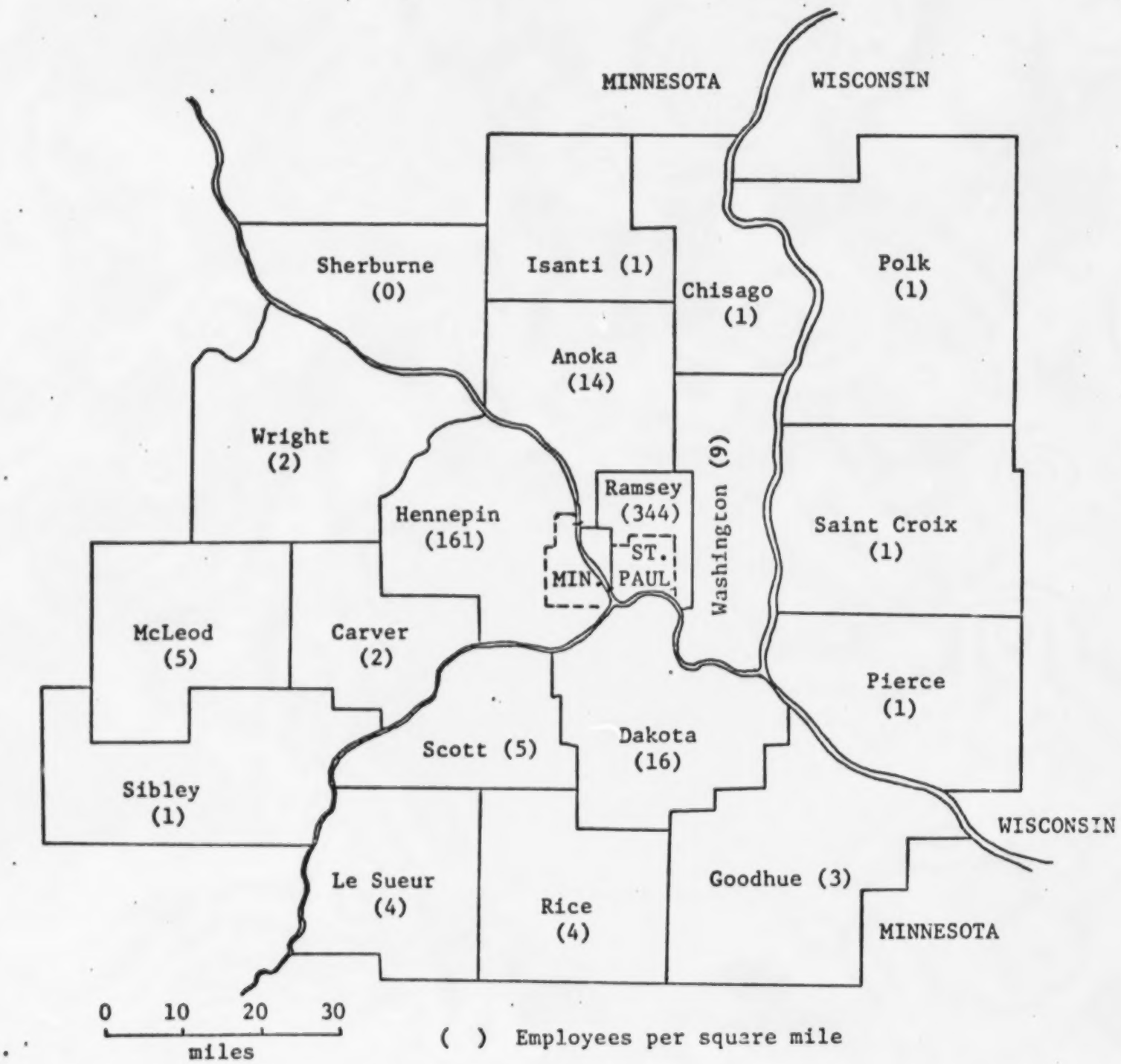

Figure 2.4 Manufacturing Employment Density

3.0 DATA COLLECTION

Emission Inventory data were collected to provide specific information appropriate to the calendar year 1970 on area and point sources for five air pollutants-particulates, sulfur oxides, carbon monoxide, hydrocarbons and nitrogen oxides. The inventory was conducted according to the Federal requirements listed in the April 7, 1971 Federal Register. The State of Minnesota will use the inventory as part of the input information required in the Implementation Plans called for by the Clean Air Act of 1970. The inventory will also be useful for updating the files of the Pollution Control Agency, thereby providing a basis for statewide enforcement activities.

As the returns came in, the Pollution Control Agency would make a copy of the returned questionnaire and send it to TRC for processing. A master list was compiled by TRC for each county of all the mailings and a copy was provided to the Pollution Control Agency and the Region V office.

Area source information was obtained from a number of publications and personal correspondence previously listed. The techniques outlined by Bierbaum were closely followed when specific information was not available.

The air pollution emission inventory consists of data obtained through the questionnaires and other source material, plus estimates in those areas where there is a lack of specific information. The estimates are based on generally acceptable techniques, augumented by the intimate knowledge of the state supplied by the Pollution Control Agency. TRC's previous and current experience with similar emission inventories was also used to prepare the following data summaries. The resulting inventory is directly applicable for use in the required Implementation Plans.

3.1 Methodology

The overall methodology used in the Minnesota air pollution emission inventory centered on correctly apportioning various types of fuels, process emissions, and combustible solid waste. Totals for all types of fuels, process emissions and solid waste were determined from the tabulated sources. The fuels and solid waste were apportioned according to population and applicable land use variables in each region. Once subtotals had been established for fuels and solid waste for the seven AQCR's, the quantities reported by "point source" questionnaires were subtracted resulting with the quantities of fuel that would be available for area source apportioning.

For Minnesota, a point source was defined as one that had fuel burning operations that emitted over 25 tons/year of any one of the five pollutants or was in one of the special SIC categories (SIC 2000, 2200, 2600, 2800, 2900, 3200, 3300, 3400). Fuel burning operations that consumed 348 tons/year of 9.0% ash, 2.0% S coal; 159,235 gallons/year of 2.0% S residual oil; 1,173,708 gallons/year of .3% S distillate oil; or 665 x $10^6 ft^3$ of normal natural gas would produce, respectively, 25 tons per year of particulate (coal), sulfur oxides (residual oil), sulfur oxides (distillate oil) and nitrogen oxides (natural gas).

All area and point source information was either collected or broken down to a county or political jurisdiction basis. The seven county area of greater Minneapolis-St. Paul was further broken down into 190 "grid squares". The "grid squares" depict the typical midwestern confluence of area and point commercial, industrial and residential sources. These grids indicated the greater emission density that could lead to high atmospheric concentrations over a localized area.

The overall concept of area source "smearing" as conducted for the

Minnesota inventory represented the major compromises which had to be made in the program. The concept of an emission inventory implies knowledge on at least three precepts of the reported emission: how much, where and when. The less precise any one of the three is, the less is known about the total situation.

3.2 Area Source Emissions

Estimation of area source emissions for the seven regions in Minnesota relied upon many of the techniques outlined by Bierbaum. In many cases specific information for the calendar year 1970 was not available and estimates had to be made on information already obtained by TRC.

To facilitate the explanation of the reported fuel tallies, process emissions and combusted solid waste, the discussion will focus on one fuel or category at a time with reference to EPA source Category Totals Input Sheets, Tables I, II and III. These tables are not a part of this report.

3.2.1 Coal

The Bituminous Coal and Lignite Distribution for 1970 listed a state-wide total of 8,769,000 tons of coal for Minnesota. The introduction of the report indicates that the information compiled within the report is based on reports submitted to the Bureau of Mines,voluntarily by producers, sales agents, distributors, wholesalers and Great Lakes and tidewater commercial dock operators who normally produce or sell 100,000 tons or more annually. Therefore it can be assumed that the above figure is a minimum. Point Sources in Minnesota reported approximately 7.3 million tons. However, using Bierbaum's techniques for estimating area sources resulted with approximately 4.2 million

tons. The sum of point and area sources therefore results with a total for the state of 11.5 million tons, 2.8 tons more than the Bureau of the Mines tally. TRC used the higher figure, to account for a greater amount of fuel used.

The domestic coal was apportioned by the number of coal burning homes in each county according to the 1960 Census report and summed by region. From data supplied the Pollution Control Agency, a region wide degree day average was determined from 1968 degree day information. This resulted with a low of 7500 degree days for region 133 (Southwest Minn.) to a high of 9512 degree days for region 129 (Duluth-Superior). The total amount of coal apportioned to dwelling units was approximately 1 million tons.

The commercial and industrial area sources were apportioned according to the number of establishments listed in the 1967 U.S. Census of Retail Trade and the 1963 U.S. Census of Manufacturing. Total commercial and industrial area source emissions were estimated to use approximately 3 million tons of coal. Part of the overage between the Bureau of the Mines tally and the total reported could result from using the total number of establishments instead of those that actually used coal.

From "Combustion Engineering" Glen R. Fryling M.E., it was determined that the coal shipped to Minnesota was 9.0% ash and 2.0% sulfur by weight.

3.2.2 Residual and Distillate Oil

The Bureau of the Mines publication of Sales of Fuel Oil and Kerosine in 1969 provided the major input for all fuel oil calculations. The Bureau of Mines tally lists 9 categories depicting various uses of both distillate and residual oil. The 9 categories listed in the Bureau of the Mines publication were: kerosine and heating oil, industrial (#2 and #6), oil company (#2 and #6), railroads (#2 and #6), vessels (#2 and #6), utility (#2 and #6)

and vehicles (#2 and #6). These categories were combined to correspond to the ones needed on the EPA emission forms of residential, commercial, industry, vehicles, vessels, and railroads. To account for the increased usage between 1969 and 1970, TRC assumed a 5% growth in all categories, which amounted to a grand total of both distillate and residual of approximately 1.3 billion gallons for the 1970 calendar year.

The domestic oil consumption was based on 1960 U.S. Census report which listed the total number of oil heated dwelling units in each county. From the 1968 degree day information, degree days for each county were determined. Multiplying the number of dwelling units in each county by the 1968 average for degree days for that county and summing by region resulted in seven region factors. These factors were divided by the sum of the factors to proportion by requirements for residential heating emission to be attributed to specific, regional heating needs. Of the total 1.3 billion gallons of oil used, .7 billion gallons were used for residential space heating.

From the Bureau of Mines tally it was determined that 70 million gallons of #2 and 55 million gallons of #6 would be apportioned to commercial sources, and 59 million gallons of #2 and 178 million gallons of #6 would be apportioned to industrial users which according to the EPA breakout would include electric utilities. The fuel was apportioned according to the total number of establishments as listed in the 1967 U.S. Census of Retail Trade and the 1963 U.S. Census of Manufacturing. From the totals reported for each category were subtracted the amounts reported from the point source questionnaires which were then reported under area sources. This resulted with 69 million gallons of #2 and 51 million gallons of #6 being apportioned to commercial area sources, and 37 million gallons of #2 and 111 million gallons of #6 being apportioned to industrial area sources.

The EPA categories of Railroads, Vessels, and Diesel Motor Vehicles were taken directly from the Bureau of the Mines tallies. Since no point source was recorded under these categories, the total amount was entered under the area source categories.

From fuel dealer reports it was determined that residual oil was 2% sulfur by weight and the distillate oil was 0.3% sulfur by weight. These figures were entered into the proper fields in the EPA computer input forms Table II.

The gridded region 131 (the seven county area that includes Minneapolis-St. Paul) was handled a little differently than the other 6 regions in Minnesota. Previously EPA and the Pollution Control Agency had done extensive work in determining exact locations of area source emissions for particulates and SO_2. TRC took the emissions that had been calculated and back calculated to the original sources. These numbers were then used as the apportioning factor in Table III with the most recent fuel, process and solid waste tallies entered on Table I.

3.2.3 Natural and Bottled Gas

The State of Minnesota has two natural gas companies, Northern Natural Gas and Midwestern Gas Transmission Company. Their transmission lines cover the majority of the state with all "populated" areas receiving supplies of natural gas. The 1970 Gas Fact of the American Gas Association Inc. provided a statewide breakout of how gas was used in Minnesota. Gas Facts attributed 33% to residential use, 14% to commercial use and 53% to industrial and utility use. A statewide total of 321,947 million cubic feet was determined for the entire state. Of this total roughly 186,000 million cubic feet was consumed in the seven county Minneapolis-St. Paul AQCR.

From the 1960 U.S. Census of Housing the number of natural or bottled

gas homes was determined. These figures were used as the apportioning factors in Table III.

The number of gas burning dwelling units times the average degree days for each county were used in determining the seven factors used to determine how the natural gas should be apportioned by county, similar to the way the domestic oil was apportioned. Since the number of bottled gas heated dwelling units was so small, no additional gas was added for their emission. These dwelling units were simply put under the natural gas totals for each respective region.

3.2.4 Domestic and "Other" Wood Burning

With no conclusive information on the quantity of wood burned in Minnesota, estimates were made for domestic consumption of wood using a revised Bierbaum technique. The procedure involved determining the ratio of the heat content of coal versus wood. This ratio was multiplied by the "Bierbaum" calculated number for coal to result with a number of tons of wood. A value of 21.0×10^6 BTU/cord was used from the EPA emission factor book. A specific gravity of .8 gm/cc was used to obtain a density of 51.2 lbs/ft^3. This amounts to 6.4×10^6 BTU/ton of wood, about half the value for coal. For the number of wood burning dwelling units as reported in the 1960 Census, this results in a total of approximately 9 million tons for the whole state with none apportioned in the seven county area.

3.2.5 Open Burning and Incineration

From the "Study and Investigation of Solid Waste Control for the

Minnesota Pollution Control Agency, Phase II Final Report, 1969" TRC determined that 87% of all domestic waste produced in Minnesota was open burned and the EPA estimate of 5.5 lbs per person per day of disposable solid waste was used. Subsequent to 1970, open burning was banned.

From 1970 U.S. Census population estimates by county, regional solid waste tonnages were determined and entered in the appropriate places on Table I. The actual county populations were used as the apportioning factors and entered in the appropriate place on Table III.

3.2.6 Solvent Evaporation

The emissions in this category were based on EPA supplied data of 30 lbs./person year. The population was listed by county and gridded areas on Table III and was multiplied by 30/2000 to obtain tons per year for the entry on the EPA Table I by region.

3.2.7 Diesel Vessels

Approximately 80% of all vessel traffic was assumed to be located in the port of Duluth (Region 129) by TRC and the Pollution Control Agency. The remaining 20% was assumed to be located in the Region 131, the seven county region. Approximately 1 million gallons of fuel oil were apportioned between the two regions for this purpose.

3.2.8 Railroads

From the Bureau of the Mines Report, total fuel usage by railroads

was determined to be approximately 86 million gallons. Track mileage was roughly measured from available maps. Table 3.1 presents the breakout that was determined for rail emissions for Minnesota.

Table 3.1 Railroad Emissions by Region

Region Number	Percent of Emissions
127	4
128	9
129	12
130	1
131	54
132	12
133	8

The 54% for Region 131 was determined from the extensive grid by grid analysis previously worked out by EPA and the Pollution Control Agency.

3.2.9 Diesel Motor Vehicles

From the Bureau of the Mines tally a fuel consumption of approximately 277 million gallons was noted for all types of diesel road traffic. This was apportioned by region according to diesel vehicle registrations in the percentages listed in Table 3.2.

Table 3.2 Diesel Vehicle Emissions by Region

Region Number	Percent of Emissions
127	6
128	12
129	8
130	1
131	57
132	10
133	6

The emissions were apportioned by county according to vehicle registration. The number of registrations were entered as apportioning factors in Table III.

The respective fuel totals were entered in Table I.

3.2.10 Gasoline Motor Vehicles and Gasoline Evaporation

From Department of Taxation, State of Minnesota, we obtained the 1969 total gallongage of gasoline sold in each county. TRC applied an across the board increase of 5%. The assumption was made that the fuel was burned in the county in which it was purchased and the evaporation would occur in the county in which it was purchased. Table 3.3 presents the distribution which was made by region according to the respective county totals for both engine exhaust and gasoline evaporation.

Table 3.3 Engine Exhaust and Gasoline Evaporation Emissions by Region

Region Number	Percent of Emission
127	7
128	16
129	8
130	2
131	43
132	13
133	11

The gallonage figures were entered as the apportioning factors on Table III. In Region 131, however, the previously described technique using past work was used for the 190 grid squares.

The gallonage figures were multiplied by the EPA-recommended 12.5 MPG to arrive at total vehicle miles for each region. In Region 131 all the vehicle miles were assumed to be in the 25 MPH category. In all the other regions the mileage was split equally between the 45 MPH and the 25 MPH categories.

3.2.11 Additional Emissions

Under the hand calculated emissions category, two different types of

emissions were listed for Region 131. These were airport emission and area source process emission.

From the previously completed grid work on Region 131, the actual locations of airports within the grid squares were used to assign airport emissions. From the tabulated schedules of the airport-supplied mix of airplanes that serve the airports in the Greater Minneapolis-St.Paul area, specific emissions were calculated for each airport. The latest figures for take-off and landing cycles were found in the EPA emission factor book. The resulting emissions in tons were tabulated on the appropriate Table III forms that corresponded to the grid squares and portions of grid squares in which the airports were located.

The process emissions were taken directly from the previous EPA work and were inserted on the proper Table III forms, specifying the grid squares from which the emission originated.

3.3 Point Source Emissions

The gathering of the point source information was undertaken by TRC under the direction of the Pollution Control Agency and the Region V office. TRC began with the Minnesota Directory of Manufacturers and selected manufacturing establishments that were listed under the special SIC classification or that employed over 100 persons. The Pollution Control Agency also supplied an additional list of various grain handling asphalt batch and taconite operations. Hospitals over 100-bed capacity also received questionnaires. Municipalities in excess of 10,000 persons also received questionnaires. Questionnaires sent to St. Cloud were divided evenly among

3 counties and the ones sent to Granite Falls were divided equally among 2 counties. In total, four different questionnaires and two different form letters were used.

Shortly after the questionnaires and form letters were sent out, the president of the Grain Handling Association mentioned to the Pollution Control Agency that he felt a number of significant operations had been overlooked. Additional questionnaires were sent to grain handling operations identified by the association, to include those which processed in excess of 200,000 bushels per year.

In total, 1231 questionnaires were prepared by TRC and mailed out from the Pollution Control Agency. These included 54 municipalities and 22 power plants. One month after mailing (the specified deadline in the questionnaire), the majority of the questionnaires had not been returned and follow up letters were sent to the non-responders. At the end of the second month, a few hundred significant sources had not responded and these were sent a second follow up letter, reminding them of their legal obligation to make a response.

On August 1st the last questionnaires were accepted for processing. As of then the official tally for questionnaires was as shown in Table 3.4.

Region 131 was inventoried in 1969 with a total of approximately 150 point sources. These sources were recontacted by the Pollution Control Agency for any significant changes. About 15 sources indicated changes and thse changes were used by TRC in updating the 1969 inventory.

Table 3.4 Breakout of Questionnaire Status by Region

Region Number	Number Sent Out	Number Returned	Percent Response
127	107	77	72
128	456	263	58
129	150	109	73
130	29	22	75
132	225	168	75
133	264	195	74
Total	1231	834	68

The following paragraphs depict how the point source coding forms were completed. The data on the coding forms were punched on computer cards and used as direct input to the EPA point source program. For some sources the emissions were hand calculated (as described above for airports and special processes) and entered on the coding forms. In most cases, the basic data on apportionment, specific fuel usage, or process weight were entered, and computations of emissions were accomplished by the EPA computer program.

The coded forms then became the basis for the computer data cards. The EPA program provided printouts of the basic data (source, location, type, operating hours, fuel characteristics, emissions and summaries of fuels and emissions by political jurisdiction). Further, the program was used to generate an Air Quality Display Model (AQDM) card deck.

3.4 Methodology Used for EPA Point Source Data Form

CARD A

Source Number: These numbers were assigned after all questionnaires were completed. This assured that each completed form would have a unique, consecutive number.

Region Number: The number referred to the Air Quality Control Region assigned by the Federal Government in Table 8 of the Point Source Data Format Instructions.

SIC Code: A number assigned at the time the form is filled out based on general information supplied on the returned questionnaire.

Process Code: A list of process codes was provided in Table 9 of the Point Source Data Format Instructions. The numbers ranged from 00 to 90 in increments of ten. Numbers 10 through 90 listed some type of coal combustion. Process code 00 was used for all other fuels, including distillate and residual fuel oil, natural gas and solid waste combustion. Process codes with numbers 1 through 9 in the units digit (01-09) indicated specific source characteristics as enumerated in the instructions.

Site Number: A site number was assigned to each different address.

Descriptive Name: This is either the entire name or a contraction of the name of the company or institution.

X and Y Coordinates: Minnesota is in UTM grid zone 15. Only in Region 131 were grid coordinates use for point sources. In all other Minnesota regions the grid coordinates were left blank.

Political Jurisdiction: A two-digit number assigned to each county within an air quality control region as listed in Table 8 of the Point Source Data

Format Instructions.

Ownership: The sources were characterized as private, local government, state government, federal government and steam-electric utility.

Source Type: This further identifies the source as (1) industrial process source, (2) fuel combustion source and (3) waste emission source, which were already either partially or completely identified under process code.

Operating Time: Number of hours per year each source is in operation.

Stack Height: Indicates height of stack in feet above ground level. Only in Region 131 were stack heights recorded. In all other Minnesota regions the stack height was left blank.

Stack Diameter: Inside of stack in feet at the exit. Only in Region 131 was this determined.

Stack Temperature: Represents average operating conditions of stack temperature. This information was determined for only Region 131.

Stack Velocity: Average exhaust velocity at outlet. This was determined for only Region 131 point sources.

Maximum Exhaust Gas Volume: The design or maximum conditions(whichever is greater) should be used in input units in actual ACFM. The information was calculated for Region 131 only.

Normalized Plume Rise: Since the other stack parameters were determined for Region 131 plume rise was not calculated.

CARD B

Maximum Process Weight: Used only when explaining industrial process emission, represents maximum design conditions.

Normal Process Weight: Pounds per hour for actual operating practices.

Includes the weights of all solid or liquid raw materials entering process.

Comments: 6 letters available for describing the process.

Boiler Rated Capacity: Intended as design or maximum capacity for each fuel combustion source expressed in 10^6 BTU/hr.

EF: Precoded set of emissions factor numbers that pertains to a particular type of fuel burning operation. Under the respective fuel categories, yearly usage was entered.

Heat Content of Fuel: These figures were all looked up in a standard reference.[3]

CARD C

Ash and sulfur content of fuels used. This category allows for insertion of natural gas sulfur content. Area source forms do not consider this.

Particulate and SO_2 Control Efficiency: This represents the combined efficiency of all control devices used on each source.

Control Device Identification: Identification codes can be found in Table II at the Point Source Data Format Instructions, furnished by EPA.

Comments: 8 letters or less that describe the device.

Hand Calculated Emissions: Tons per year of categories not calculated by the program (process emissions and solid waste disposal).

Allowable Emissions: Tons per year of emissions allowed for any particular source based on state regulations.

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[3]For example, Combustion Engineering, G. R. Fryling, M.E., Revised Edition, Combustion Engineering, Inc., 1966.

CARD D

Columns 4 through 9 report allowable federal particulate emissions from model regulations for particulates.

Columns 10 through 15 report allowable federal sulfur dioxide emissions from model regulations for sulfur dioxide.

Comments: All point source descriptions for Minnesota include code GRZ 15 which indicates that grid coordinate zone 15 covers all of Minnesota point sources. In regions outside of 131 in Minnesota this field was used to indicate the plant address.

4.0 RESULTS OF THE EMISSION INVENTORY

The results of the work performed on the emission inventory are in three formats. The first includes the tabular information in this report, and the fuel balance and emission summaries in the remainder of this report. The second is the pictorial representation of the source category contributions, shown as pie charts. The third is the computer printout, with the detail on the sources and appropriate summaries. The printout was furnished separately to the Minnesota Pollution Control Agency and EPA Region V.

4.1 Fuel Balance

Fuel balance for Minnesota is presented in Table 4.1. These numbers reflect the same quantities that appear in the computer printout, but are broken down into individual categories for greater detail. The fuel quantities are representative of the year 1970.

4.2 Emissions Inventory Summary

The emissions inventory summary is a modified version, supplied by EPA, of the summary format of the Federal Register Guidelines. The summary for each region represents the best determination of actual emissions. Thus, for particulate air pollutants, there is no quantity ascribed to "uncontrolled emissions", although such quantities can be determined by reference to the computer printout. The tabulated summaries appear in the appendix to this report.

4.3 Source Category Contributions

The broad categories of emission sources -- residential; commercial, institutional and industrial; utilities; industrial and commercial process losses; solid waste disposal; and transportation -- are depicted in Figures 4.1 through 4.5 showing the proportion of the source category contribution to the total

emissions. Source categories which contribute less than one half of one percent toward the total pollutant do not appear on the pie charts. Such small contributions are not significant from the standpoint of identifying major regional problems. However, on a local basis a source could be significant and require action by the Pollution Control Agency, even if it is not identified on the pie chart.

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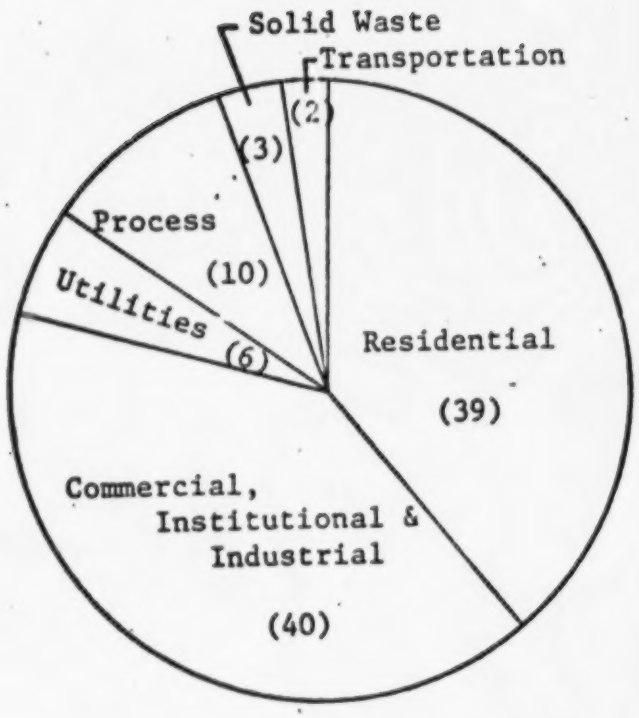
Table 4.1 Fuel Balance for Minnesota

on following two pages

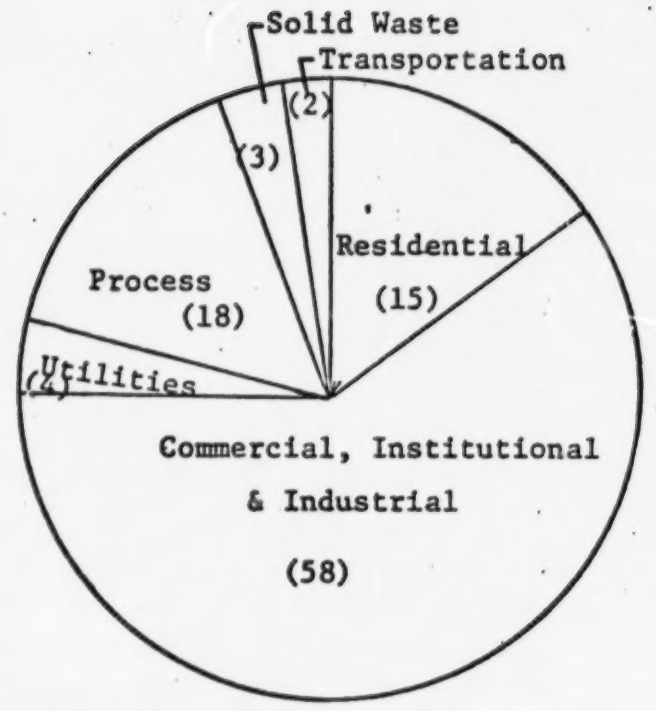
Reg No		Distillate Oil gal(1000) Res	Com	Ind	Util	Residual Oil gal(1000) Com	Ind	Util	Vehicles gal(1000) Gsln	Dsl
127	Total	20321	1366	2758	8232	5091	4683	0	137931	15949
	Pt	-0	-0	-0	-8232	-0	-1925	-0	-0	-0
	Area	20321	1366	2758	0	5091	2758	0	137931	15949
128	Total	109610	3792	13053	7048	14127	15563	21837	320376	32621
	Pt	-0	-85	-8000	-7048	-2101	-1580	-21837	-0	-0
	Area	109610	3707	5053	0	12026	13983	0	320376	32621
129	Total	94955	1834	10792	0	6834	24311	0	156704	22290
	Pt	-0	-0	-1642	-0	-0	-2262	-0	-0	-0
	Area	94955	1834	9150	0	6834	22049	0	156704	22290
130	Total	18794	221	552	0	825	1328	19	34387	2136
	Pt	-0	-0	-0	-0	-0	-0	-19	-0	-0
	Area	18794	221	552	0	825	1328	0	34387	2136
131	Total	189723	58416	4543	13016	9505	54675	548	819348	159071
	Pt	-0	-10	-1772	-13016	-1796	-22513	-548	-0	-0
	Area	189723	58406	2771	0	7709	32162	0	819348	159071
132	Total	164753	2794	10642	0	10411	25614	358	245422	27333
	Pt	-0	-0	-0	-0	-0	-1356	-358	-0	-0
	Area	164753	2794	10642	0	10411	24258	0	245422	27333
133	Total	98976	1714	6226	600	8623	15671	500	204971	18349
	Pt	-0	-800	-0	-600	-242	-1175	-500	-0	-0
	Area	98976	914	6626	0	8381	14496	0	204971	18349
	Total	697132	70137	48966	28896	55416	141845	23262	1919139	277749
	Total Pt	-0	-895	-11414	-28896	-4139	-30811	-23262	-0	-0
	Total Area	697132	69242	37552	0	51277	111034	0	1919139	277749

Table 4.1 Fuel Balance for Minnesota

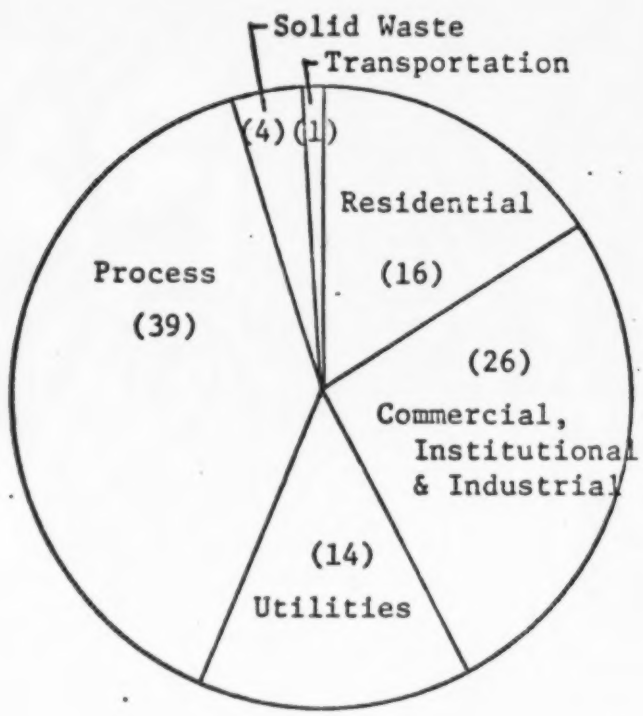
Wood	Coal				Natural Gas				RR	Vessels
tons(1000)	tons(1000)				10^6 CF or MMCF				gal(1000)	gal(1000)
Res	Res	Com	Ind	Util	Res	Com	Ind	Util	Dsl	Dsl
1594	61.7	97.9	592.5	57.8	3137	1333	4475	1464	3620	0
-0	-0	-0	-29.7	-57.8	-0	-0	-1416	-1464	-0	-0
1594	61.7	97.9	562.8	0	3137	1333	3059	0	3620	0
979	209.0	271.6	1626.0	0	18004	7653	23691	6296	7922	0
-0	-0	-0	-258.3	-0	-0	-887	-2858	-6296	-0	-0
979	209.0	271.6	1367.7	0	18004	6766	20833	0	7922	0
1475	298.1	131.4	548.2	1812.5	15931	6772	42441	0	10498	497
-0	-0	-0	-404.0	-1812.5	-0	-0	-16448	-0	-0	-0
1475	298.1	131.4	144.2	0	15931	6772	25993	0	10498	497
0	13.2	15.8	72.5	5.6	377	160	593	23	391	0
-0	-0	-0	-71.6	-5.6	-0	-0	-0	-23	-0	-0
0	13.2	15.8	.9	0	377	160	593	0	391	0
0	32.9	70.5	107.2	3448.6	41046	5949	30378	128527	46786	83
-0	-0	-48.9	-88.9	-3448.6	-0	-633	-12214	-128527	-0	-0
0	32.9	21.6	18.3	0	41046	5316	18164	0	46786	83
4801	185.2	200.2	262.5	859.3	2728	1159	4200	250	9977	0
-0	-0	-0	-147.6	-859.3	-0	-0	-1173	-250	-0	-0
4801	185.2	200.2	114.9	0	2728	1159	3027	0	9977	0
365	113.7	165.8	94.7	83.8	4051	1722	5533	1083	7239	0
-0	-0	-0	-0	-83.8	-0	-106	-157	-1083	-0	-0
365	113.7	165.8	94.7	0	4051	1616	5376	0	7239	0
9214	914.0	953.2	3303.6	6267.6	105274	24748	111581	137643	86433	580
-0	-0	-48.9	-1001.1	-6267.6	-0	-1626	-34266	-137643	-0	-0
9214	914.0	904.3	2303.5	0	105274	23122	77045	0	86433	580



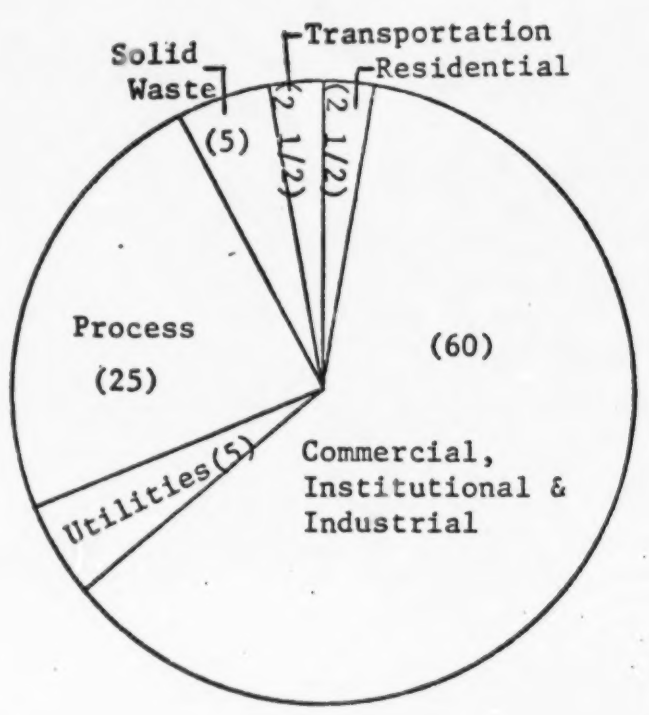
Region 127
Total: 56627 tons



Region 128
Total: 101864 tons



Region 129
Total: 141011 tons



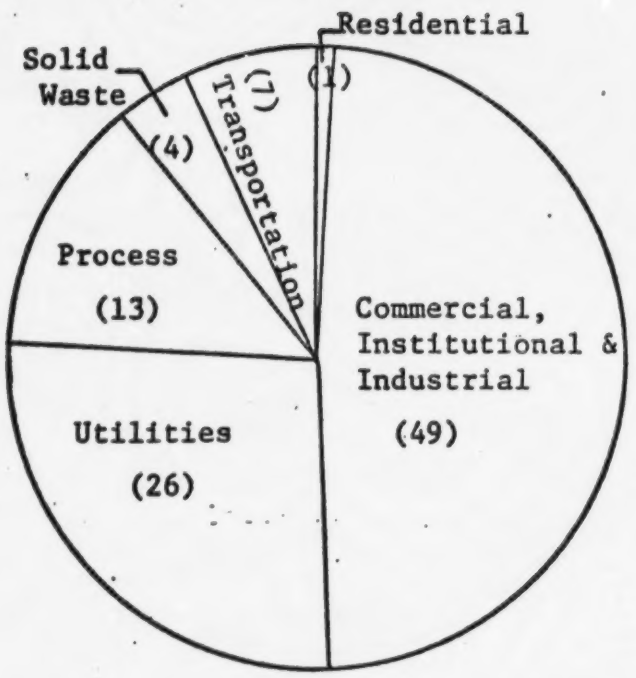
Region 130
Total: 6252 tons

Figure 4.1

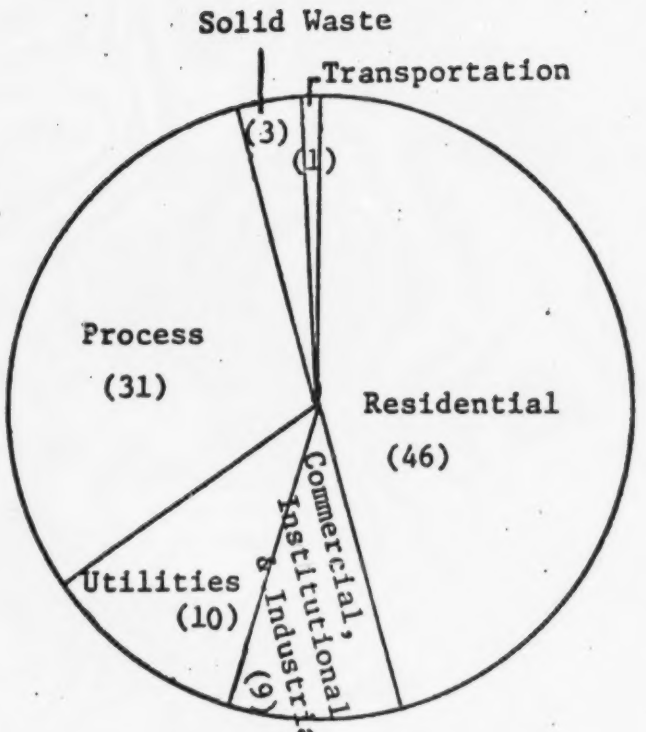
Source Category Contributions to

Particulate Air Pollutants

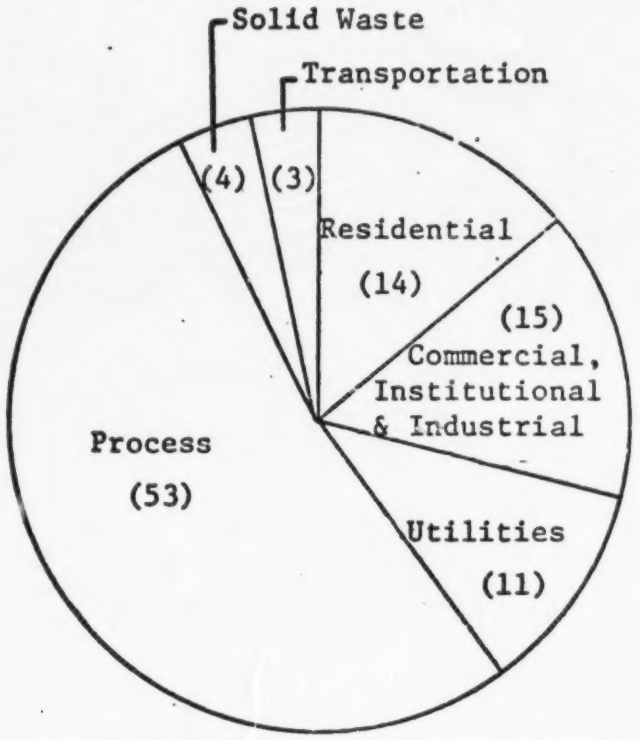
Percentages appear in parentheses. Region identifier and total emission appear below the pie charts.



Region 131
Total: 149964 tons



Region 132
Total: 143497 tons



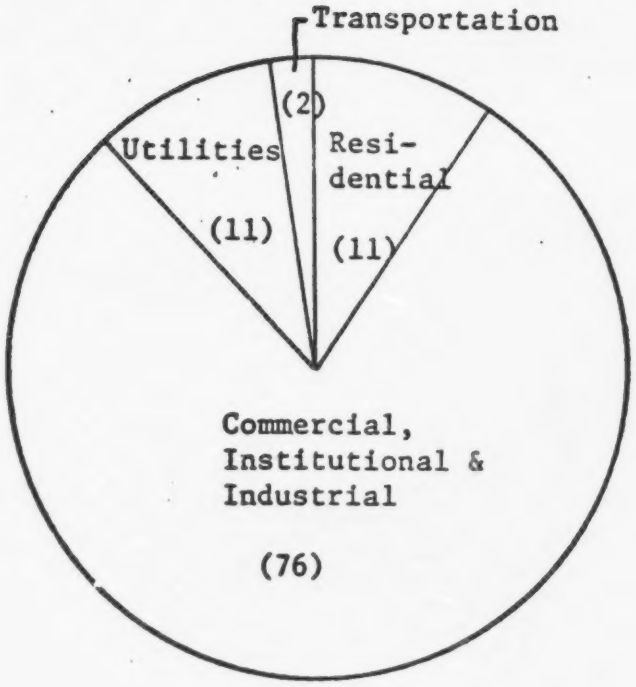
Region 133
Total: 42563 tons

Figure 4.1 (Continued)

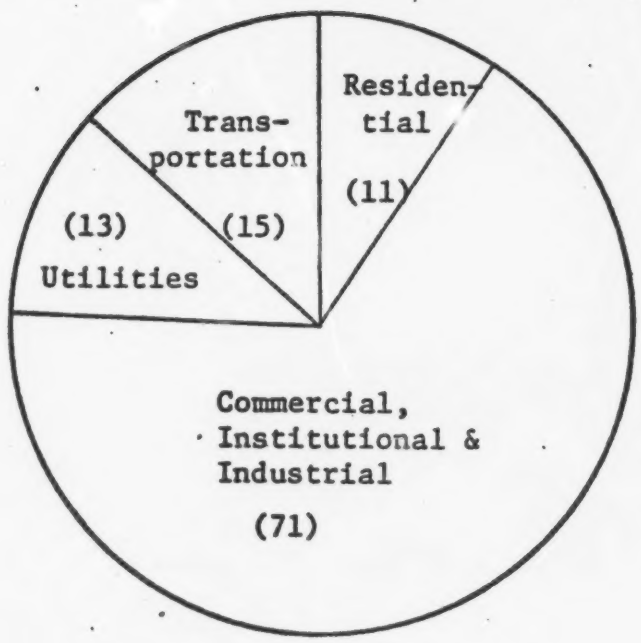
Source Category Contributions to

Particulate Air Pollutants

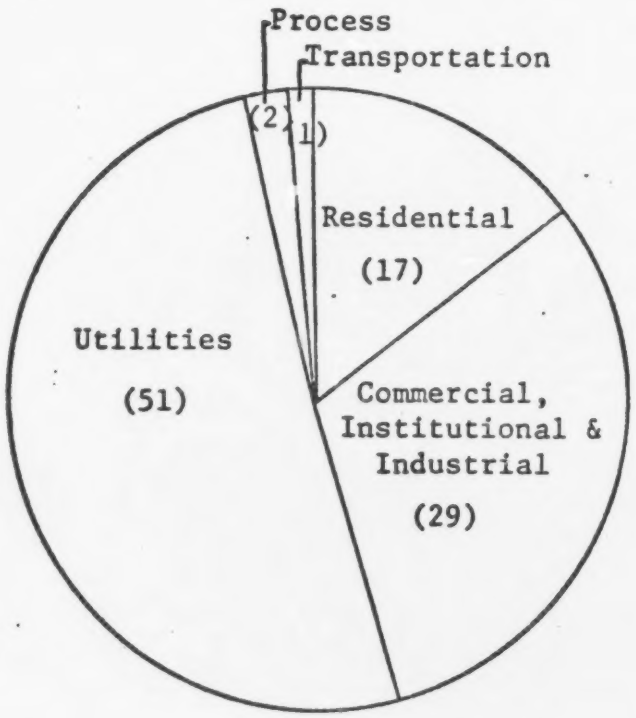
Percentages appear in parentheses. Region identifier and total emission appear below the pie charts.



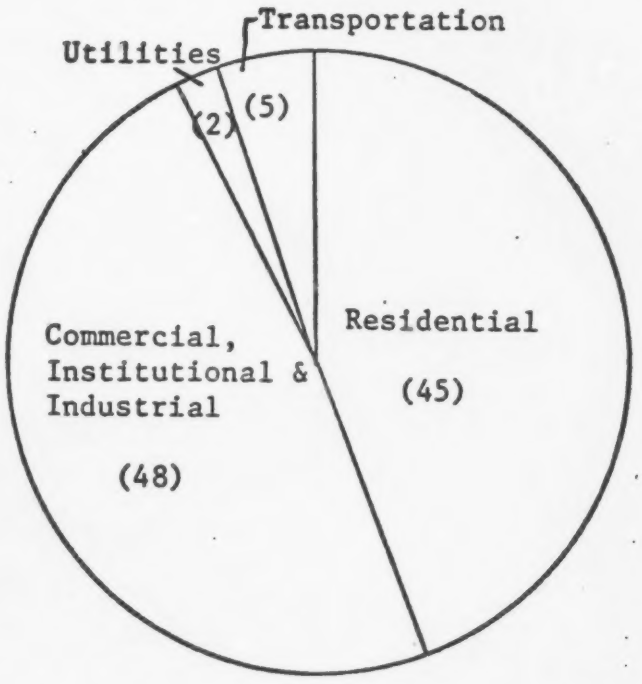
Region 127
Total: 40727 tons



Region 128
Total: 109752 tons



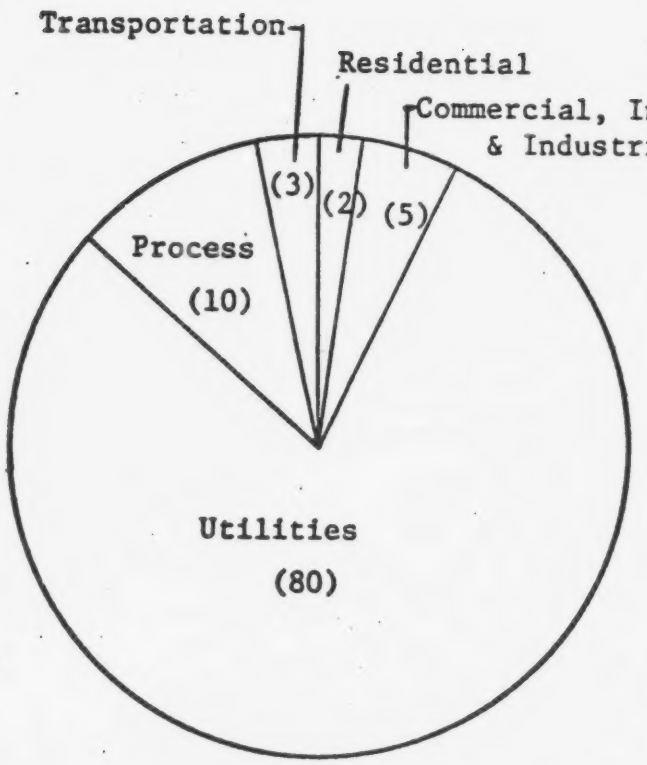
Region 129
Total: 103332 tons



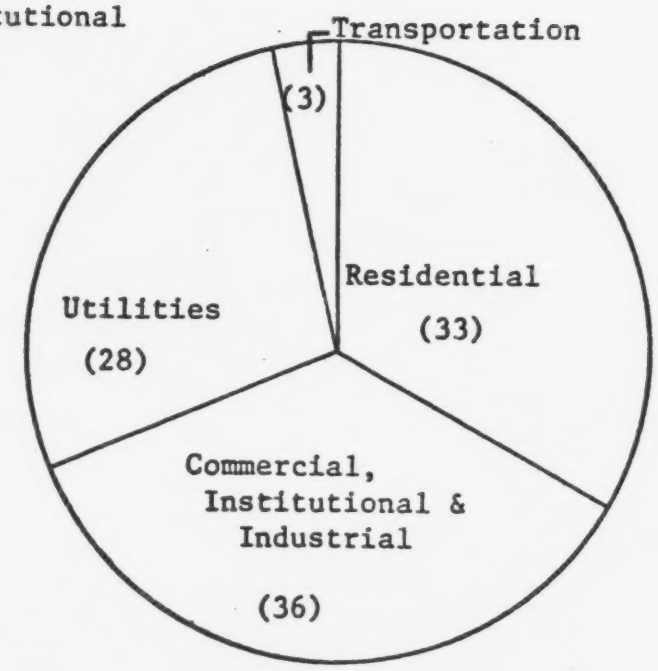
Region 130
Total: 2838 tons

Figure 4.2
Source Category Contributions to
Sulfur Dioxide Air Pollutants

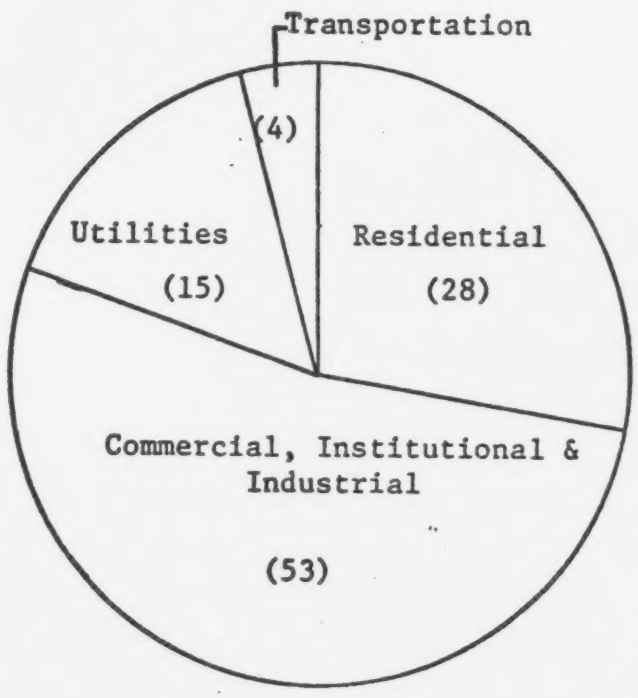
Percentages appear in parentheses. Region identifiers and total emission appear below the pie charts.



Region 131
Total: 254301 tons



Region 132
Total: 50855 tons



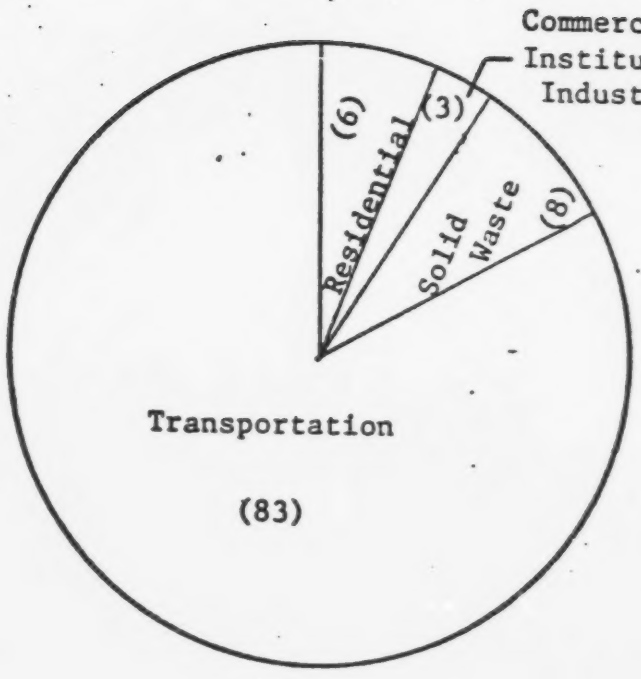
Region 133
Total: 31559 tons

Figure 4.2 (Continued)

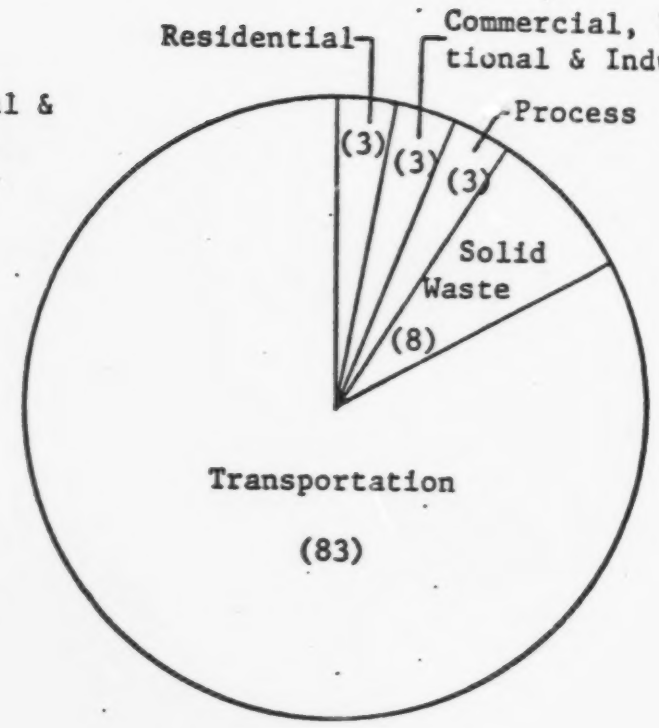
Source Category Contributions to

Sulfur Dioxide Air Pollutants

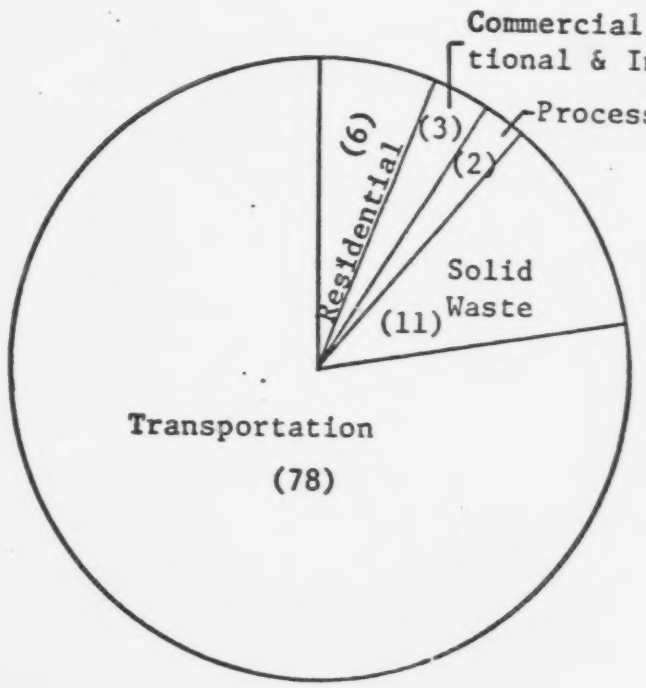
Percentages appear in parentheses. Region identifiers and total emission appear below the pie charts.



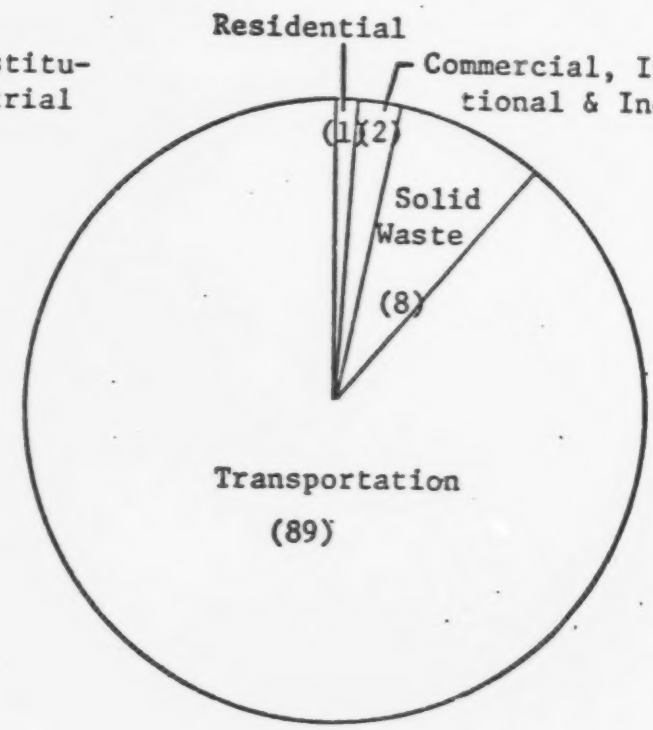
Region 127
Total: 37251 tons



Region 128
Total: 86943 tons



Region 129
Total: 47222 tons



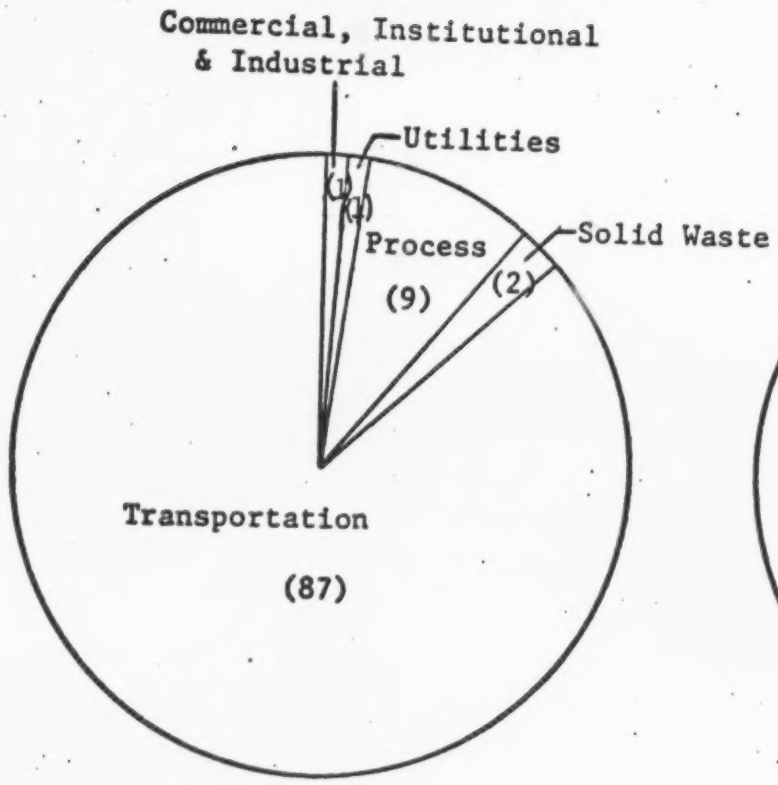
Region 130
Total: 7164 tons

Figure 4.3

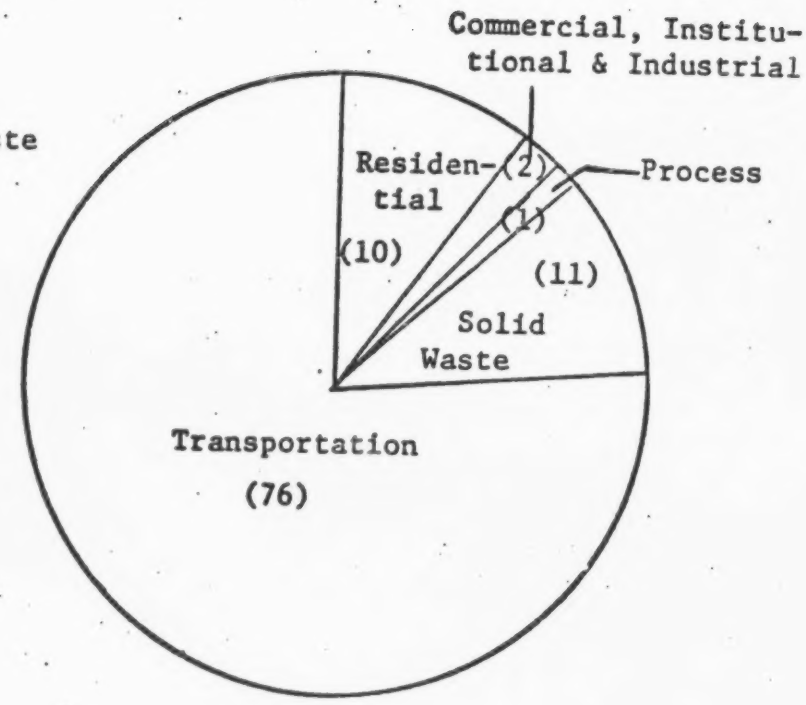
Source Category Contributions to

Hydrocarbon Air Pollutants

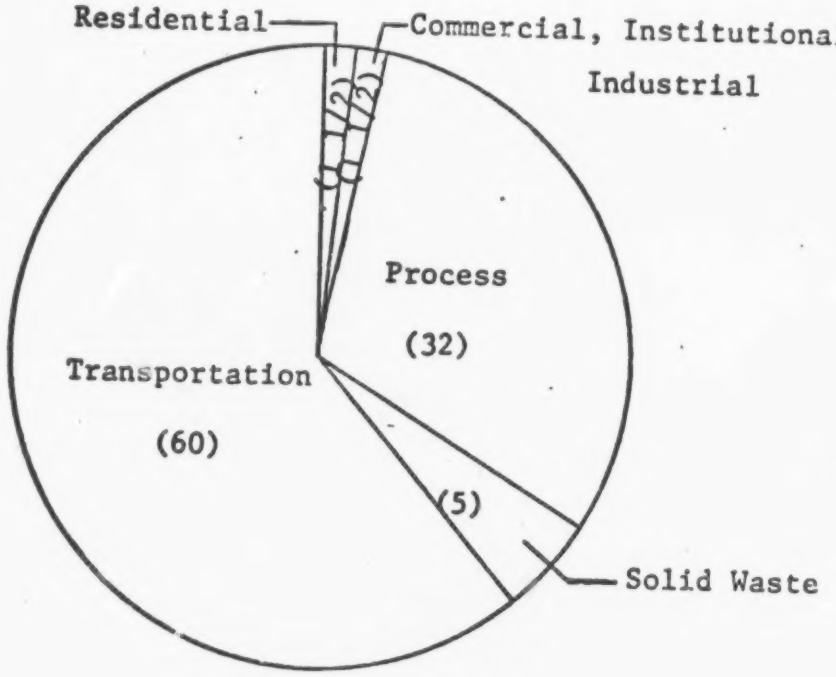
Percentages appear in parentheses. Region identifier and total emission appear below the pie charts.



Region 131
Total: 269042 tons



Region 132
Total: 63927 tons



Region 133
Total: 74837 tons

Figure 4.3 (Continued)

Source Category Contributions to

Hydrocarbon Air Pollutants

Percentages appear in parentheses. Region identifier and total emission appear below the pie charts.

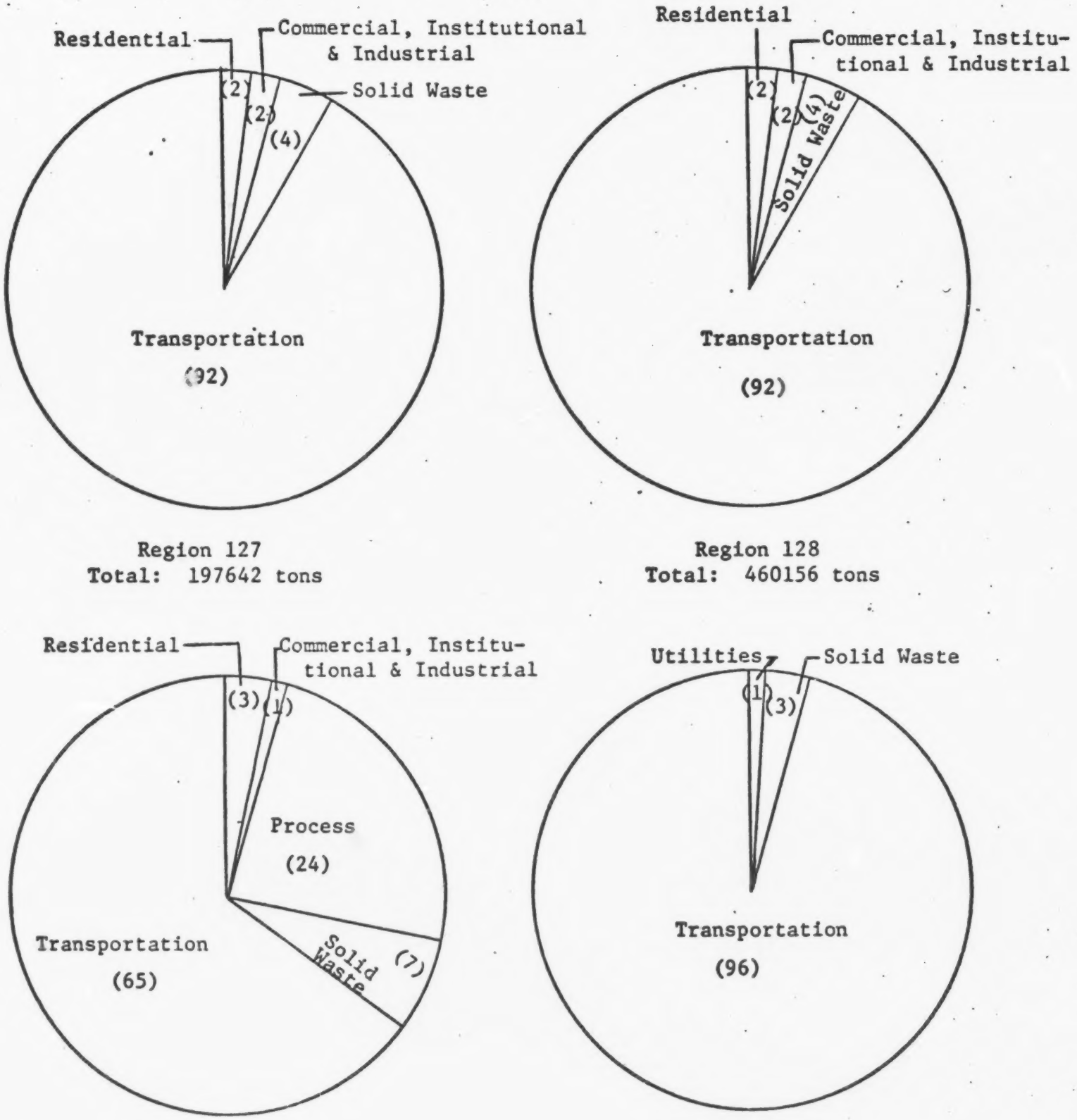
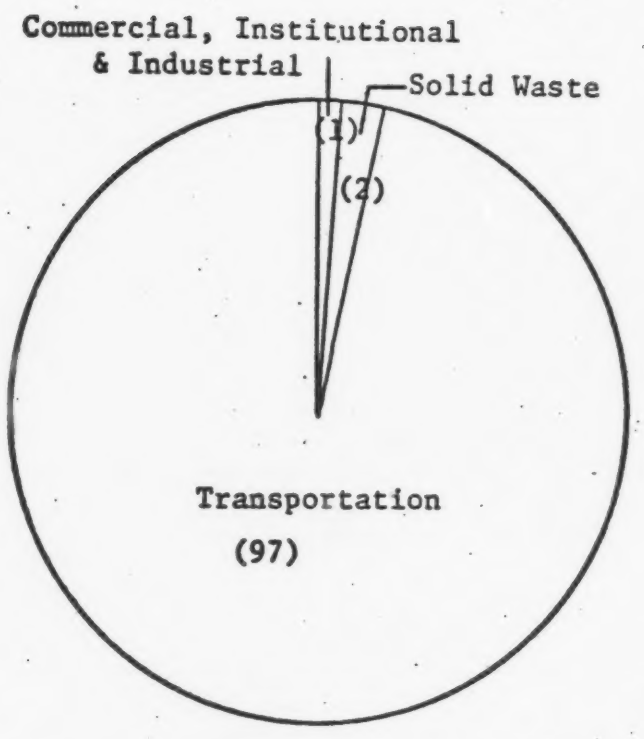


Figure 4.4

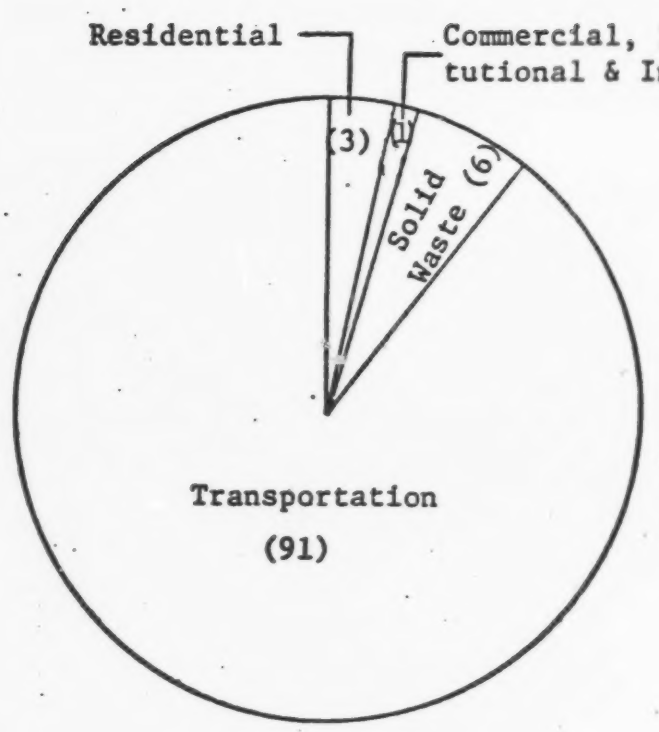
Source Category Contributions to

Carbon Monoxide Air Pollutants

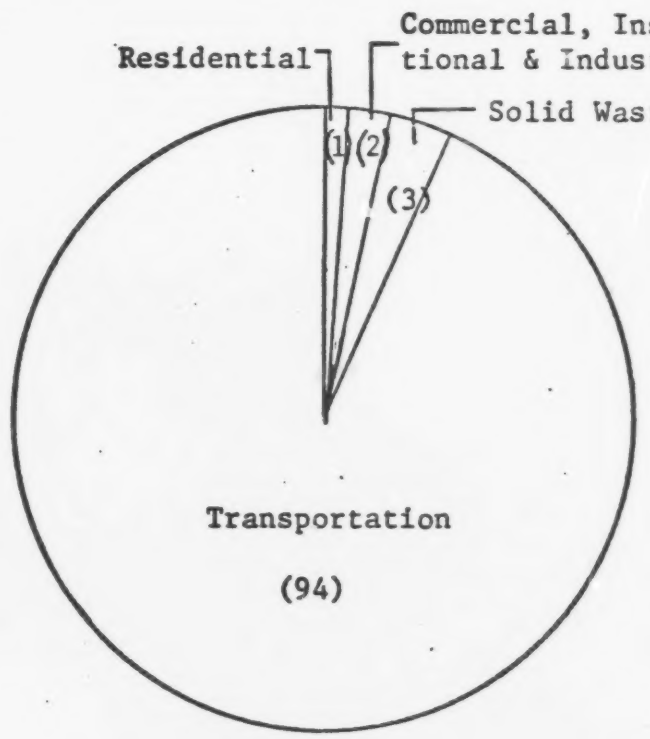
Percentages appear in parentheses. Region identifiers and total emissions appear below pie charts.



Region 131
Total: 1480520 tons



Region 132
Total: 361235 tons



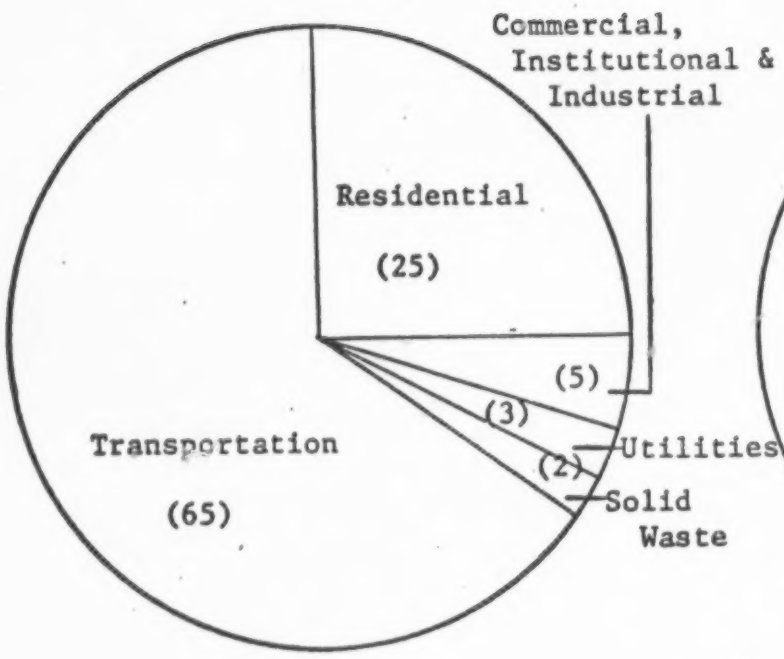
Region 133
Total: 288738 tons

Figure 4.4 (Continued)

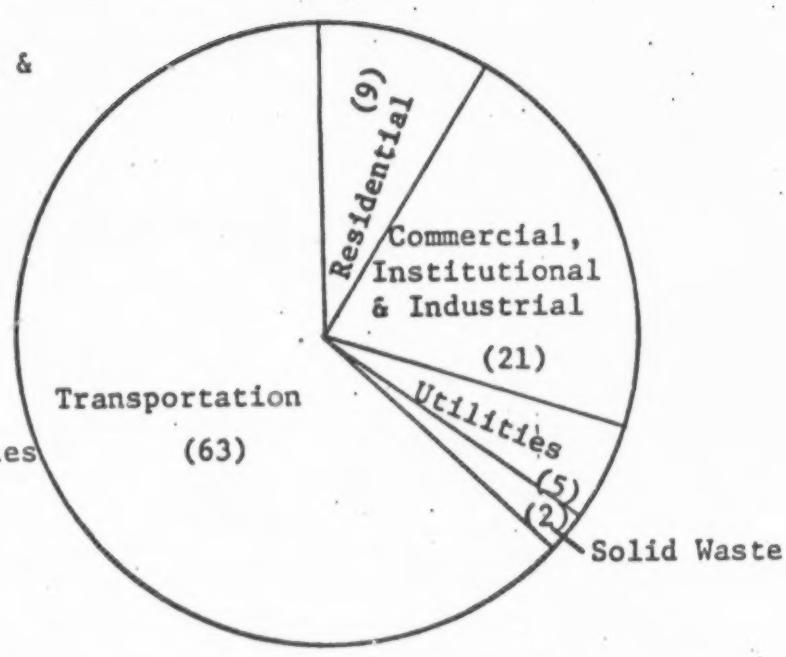
Source Category Contributions to

Carbon Monoxide Air Pollutants

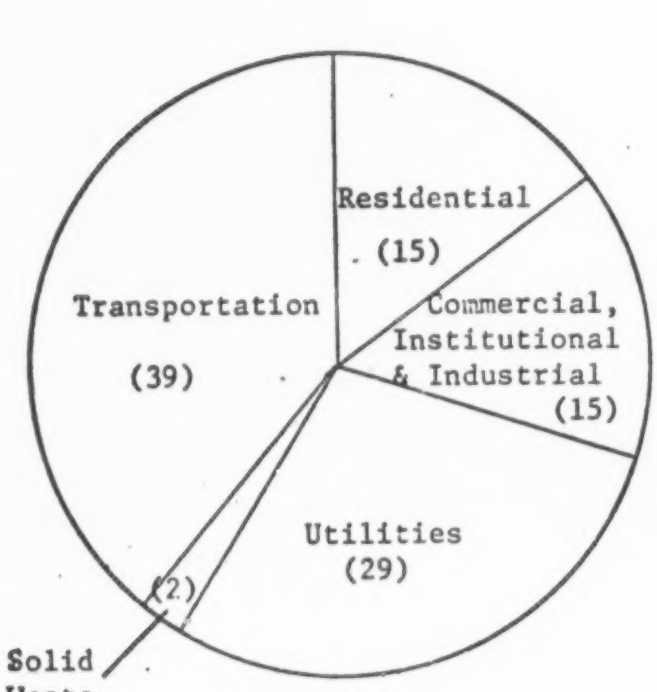
Percentages appear in parentheses. Region identifiers and total emissions appear below pie charts.



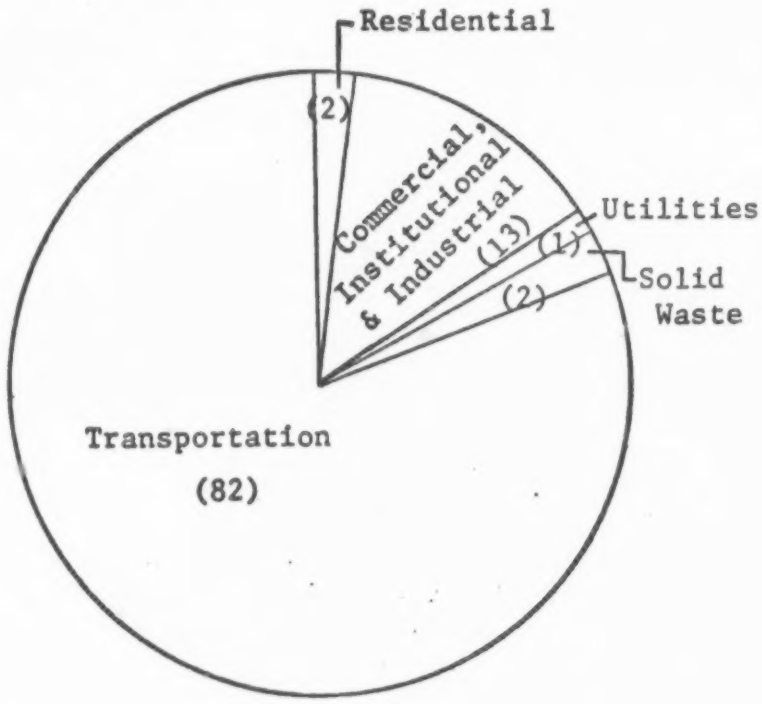
Region 127
Total: 31407 tons



Region 128
Total: 73757 tons



Region 129
Total: 61871 tons



Region 130
Total: 5809 tons

Figure 4.5

Source Category Contributions to

Nitrogen Oxide Air Pollutants

Percentages appear in parentheses. Region identifiers and total emission appear below the pie charts.

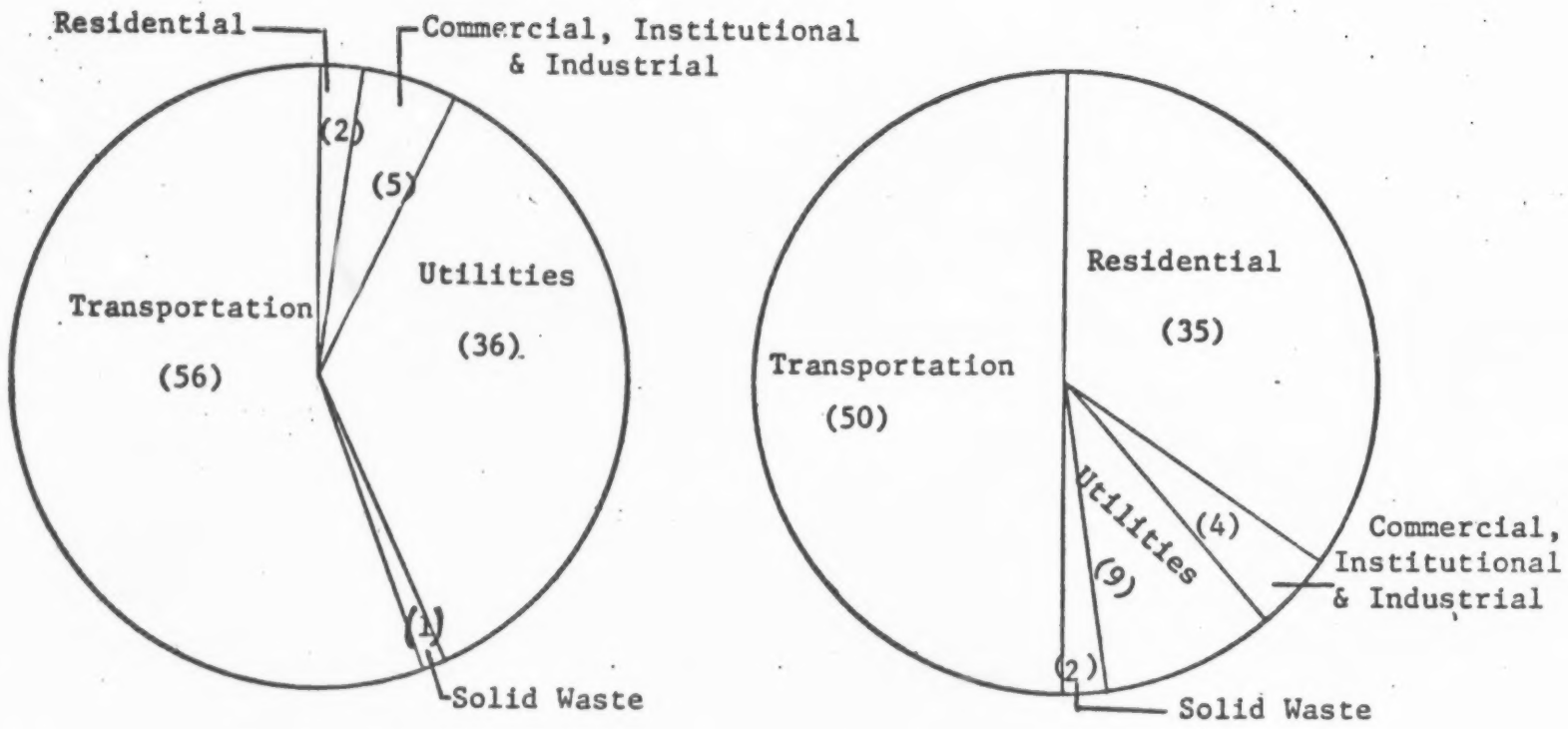


Figure 4.5 (Continued)
Source Category Contributions to
Nitrogen Oxide Air Pollutants

Percentages appear in parentheses. Region identifiers and total emission appear below the pie charts.

5.0 GRIDDED REGIONS

Minnesota is in Universal Transverse Mercater (UTM) grid zone 15. Area source data were identified by grid coordinates. Area sources use the lower left hand coordinates of the grid squares. The Minneapolis-St.Paul AQCR is scheduled for testing the control strategy for particulate and sulfur dioxide air pollutants using the Air Quality Display Model (AQDM). For this reason, additional gridding into smaller grid squares was needed for that AQCR. This had been previously done by EPA and the Pollution Control Agency. The grid is as shown in Figure 5.1. Point sources within this AQCR were located and identified by UTM coordinates.

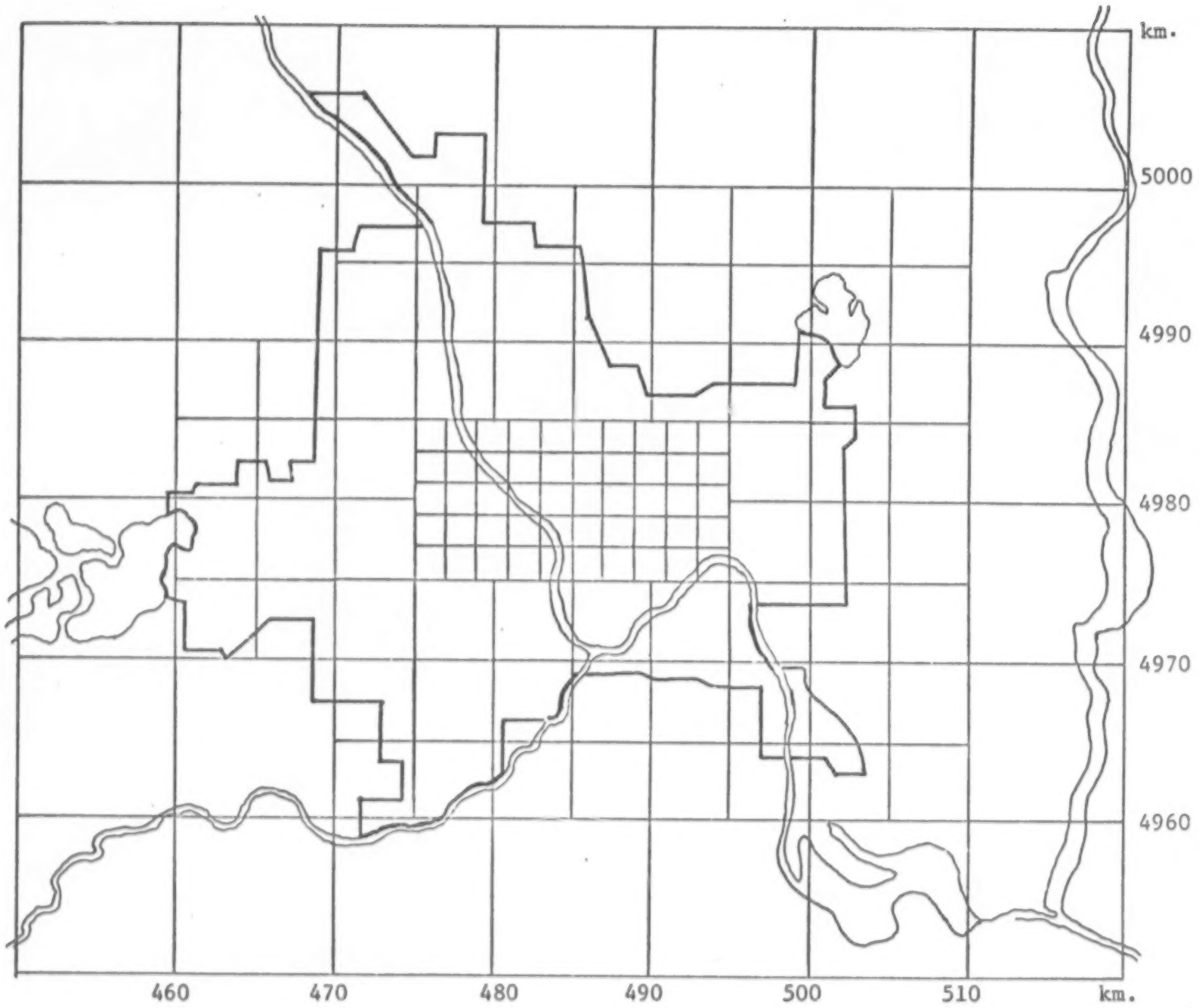


Figure 5.1 Urban and Suburban area of Minneapolis-St. Paul AQCR #131

For the State of Minnesota 127 Air Quality Control Region

Data Representative of Calendar Year 1970

NOT REPRODUCIBLE

SOURCE CATEGORY	Tons of Pollutant/Year					Fuel, Etc.	
	Part	SO_2	CO	HC	NO_x	Quantity	Units
I. Fuel Combustion							
A. Res. Fuel-Area Source							
1. (Anthracite) Coal	358	2639	1544	370	154	61741	Tons
2. Distillate Oil	102	732	51	30	122	20321	1000 Gl
3. Natural Gas	30	1	31	13	118	3137	MMCF
4. Wood	21523	1196	1594	1594	7972	1594323	Tons
5. Other							
6. Total	22013	4578	3120	2007	8366		
B. Comm.-Inst. & Ind.							
1. (Bit.) Coal a. Area Source	22638	28245	3011	868	466	660715	Tons
b. Pt. Source	44	639	149	45	89	29704	Tons
2. Coke - Pt. Source							
3. Dis. Oil a. Area Source	31	148	0	6	124	4124	1000 Gl
b. Pt. Source							
4. Res. Oil a. Area Source	91	1716	1	12	236	7849	1000 Gl
b. Pt. Source	22	368	0	3	58	1925	1000 Gl
5. Nat. Gas a. Area Source	41	1	14	66	318	4392	MMCF
b. Pt. Source	10	0	0	28	124	1416	MMCF
6. Proc. Gas - Pt. Source							
7. Wood a. Area Source							
b. Pt. Source							
8. Other a. Area Source							
b. Pt. Source							
9. Total	22877	31107	3175	1028	1415		
C. Electric Plant							
1. Anthracite Coal							
2. Bituminous Coal	3515	3973	29	9	520	57800	Tons
3. Distillate Oil	1	30	0	2	42	8232	1000 Gl
4. Residual Oil							
5. Natural Gas	6	0	0	24	236	1464	MMCF
6. Other (Peaking Turbine)	43	111	120	85	128		
7. Total	3565	4114	149	120	926	67496	
D. Total Fuel Combustion	48455	39799	6444	3155	10707		
II. Process Losses							
A. Area Sources							
B. Pt. Sources	5810	0	75	0	0	0	
III. Solid Waste Disposal							
A. Incineration							
1. On-Site a. Area Source							
b. Pt. Source							
2. Munic., etc.- Pt. Source							
B. Open Burning							
1. On-Site a. Area Source	1550	97	8232	2906	581	193705	
b. Pt. Source							

	b. Pt. Source							
9. Total		22877	31107	3175	1028	1415		
C. Electric Plant								
1. Anthracite Coal								
2. Bituminous Coal		3515	3973	29	9	520	57800	Tons
3. Distillate Oil		1	30	0	2	42	8232	1000 G
4. Residual Oil								
5. Natural Gas		6	0	0	24	236	1464	MMCF
6. Other (Peaking Turbine)		43	111	120	85	128		
7. Total		3565	4114	149	120	926	67496	
D. Total Fuel Combustion		48455	39799	6444	3155	10707		
II. Process Losses								
A. Area Sources								
B. Pt. Sources		5810	0	75	0	0	0	
III. Solid Waste Disposal								
A. Incineration								
1. On-Site	a. Area Source							
	b. Pt. Source							
2. Munic., etc.- Pt. Source								
B. Open Burning								
1. On-Site	a. Area Source	1550	97	8232	2906	581	193705	
	b. Pt. Source							
2. Dumps	a. Area Source							
	b. Pt. Source							
C. Other	a. Area Source							
	b. Pt. Source							
D. Total Solid Waste Disposal		1550	97	8232	2906	581	193705	
IV. Transportation - Area Source								
A. Mot. Vehicles	1. Gasoline	568	344	180172	25129	17543	137931	1000 G
	2. Diesel	199	359	2592	518	2711	15949	1000 G
B. Off-Highway Fuel Usage								
C. Aircraft								
D. Railroad		45	118	127	91	136	3620	1000 G
E. Vessels								
F. Gas. Evap. Losses		0	0	0	1379	0	137931	1000 G
G. Other (Solvent Evap.)		0	0	0	3660	0	3660	1000 G
H. Total Transportation		812	821	182891	30777	20390		
V. Misc. - Area Sources								
A. Agricultural Burning								
B. Other								
C. Total Misc.								
VI. Grand Total								
A. Area Source		47170	35606	197269	36642	30481		
B. Pt. Source		9451	5121	373	609	926		
C. Total		56627	40727	197642	37251	31407		

APPENDIX

EMISSIONS INVENTORY SUMMARIES

For the State of Minnesota 28 Air Quality Control Region

Data Representative of Calendar Year 1970

SOURCE CATEGORY	Tons of Pollutant/Year					Fuel, Etc.	
	Part	SO_2	CO	HC	NO_x	Quantity	Units
I. Fuel Combustion							
A. Res. Fuel-Area Source							
1. (Anthracite) Coal	1212	8936	5226	1254	523	209037	Tons
2. Distillate Oil	548	3946	274	164	658	109610	1000 Gl
3. Natural Gas	171	5	180	72	675	18004	MMCF
4. Wood	13227	735	980	980	4899	979807	Tons
5. Other							
6. Total	15158	13622	6660	2470	6755		
B. Comm.-Inst. & Ind.							
1. (Bit.) Coal a. Area Source	55502	70083	8160	2314	10937	1639374	Tons
b. Pt. Source	2338	2021	29	8	529	48751	Tons
2. Coke - Pt. Source							
3. Dis. Oil a. Area Source	66	315	1	14	263	8760	1000 Gl
b. Pt. Source	61	292	1	12	243	8085	1000 Gl
4. Res. Oil a. Area Source	299	5686	2	39	780	26009	1000 Gl
b. Pt. Source	46	678	0	3	70	3681	1000 Gl
5. Nat. Gas a. Area Source	251	8	72	444	2077	27599	MMCF
b. Pt. Source	29	0	0	74	322	3651	MMCF
6. Proc. Gas - Pt. Source							
7. Wood a. Area Source							
b. Pt. Source							
8. Other a. Area Source							
b. Pt. Source							
9. Total	58592	79083	8265	2908	15221		
C. Electric Plant							
1. Anthracite Coal							
2. Bituminous Coal	3873	10286	142	60	1669	180606	Tons
3. Distillate Oil	42	99	0	10	211	7048	1000 Gl
4. Residual Oil	251	4600	2	42	655	21837	1000 Gl
5. Natural Gas	42	1	0	125	1229	6296	MMCF
6. Other							
7. Total	4208	14986	144	237	3764		
D. Total Fuel Combustion	77958	107691	15069	5615	25740		
II. Process Losses							
A. Area Sources							
B. Pt. Sources	18324	35	1078	2595	18		
III. Solid Waste Disposal							
A. Incineration							
1. On-Site a. Area Source							
b. Pt. Source							
2. Munic., etc.- Pt. Source							
B. Open Burning							
1. On-Site a. Area Source	3753	235	19940	7038	1408	469180	Tons
b. Pt. Source							
2. Dumps a. Area Source							
b. Pt. Source							
C. Other a. Area Source							
b. Pt. Source							
D. Total Solid Waste Disposal	3753	235	19940	7038	1408		
IV. Transportation - Area Source							
A. Mot. Vehicles 1. Gasoline	1322	800	418491	58368	40748	320376	1000 Gl
2. Diesel	408	734	5301	1060	5546	32621	1000 Gl
B. Off-Highway Fuel Usage							
C. Aircraft							
D. Railroad	99	257	277	198	297	7922	1000 Gl
E. Vessels							
F. Gas. Evap. Losses	0	0	0	3204	0	320376	1000 Gl
G. Other (Solvent Evap.)	0	0	0	8865	0	8865	1000 Gl
H. Total Transportation	1829	1791	424069	71695	46591		
V. Misc. - Area Sources							
A. Agricultural Burning							
B. Other							
C. Total Misc.							
VI. Grand Total							
A. Area Source	76858	91740	458904	84014	68811		
B. Pt. Source	2[illegible]6	18012	1252	2929	4946		
C. Total	101[illegible]64	109752	460156	86943	73757		

Data Representative of Calendar Year 1970

SOURCE CATEGORY		Tons of Pollutant/Year					Fuel, Etc.	
		Part	SO_2	CO	HC	NO_x	Quantity	Units
I. Fuel Combustion								
A. Res. Fuel-Area Source								
1. (Anthracite) Coal		1729	12745	7453	1789	745	298121	Tons
2. Distillate Oil		475	3418	237	142	570	94955	1000 Gl
3. Natural Gas		151	5	159	64	597	15931	MMCF
4. Wood		19922	1107	1476	1476	7379	1475729	Tons
5. Other								
6. Total		22277	17275	9325	3471	9291		
B. Comm.-Inst. & Ind.								
1. (Bit.) Coal	a. Area Source	7345	11785	3430	861	1411	275683	Tons
	b. Pt. Source	27963	9451	250	94	3493	404046	Tons
2. Coke - Pt. Source								
3. Dis. Oil	a. Area Source	83	395	1	17	330	10984	1000 Gl
	b. Pt. Source	12	71	0	2	50	1642	1000 Gl
4. Res. Oil	a. Area Source	333	6314	3	43	866	28883	1000 Gl
	b. Pt. Source	26	332	0	3	67	2262	1000 Gl
5. Nat. Gas	a. Area Source	298	10	73	547	2528	32765	MMCF
	b. Pt. Source	47	1	1	104	456	16648	MMCF
6. Proc. Gas - Pt. Source								
7. Wood	a. Area Source							
	b. Pt. Source							
8. Other	a. Area Source							
(Coke Gas)	b. Pt. Source	13	1351	0	0	0	0	
9. Total		36120	29710	3758	1671	9201		
C. Electric Plant								
1. Anthracite Coal								
2. Bituminous Coal		20350	52098	911	276	18740	1812500	Tons
3. Distillate Oil								
4. Residual Oil								
5. Natural Gas								
6. Other								
7. Total		20350	52098	911	276	18740		
D. Total Fuel Combustion		78747	99083	13994	5418	37232		
II. Process Losses								
A. Area Sources								
B. Pt. Sources		55295	2854	76975	1114	81		
III. Solid Waste Disposal								
A. Incineration								
1. On-Site	a. Area Source							
	b. Pt. Source							
2. Munic., etc.- Pt. Source		3633	0	10537	854	427	36849	Tons
B. Open Burning								
1. On-Site	a. Area Source	2274	142	12079	4263	851		

9. Total		36120	29710	3758	1671	9201		
C. Electric Plant								
1. Anthracite Coal								
2. Bituminous Coal		20350	52098	911	276	18740	1812500	Tons
3. Distillate Oil								
4. Residual Oil								
5. Natural Gas								
6. Other								
7. Total		20350	52098	911	276	18740		
D. Total Fuel Combustion		78747	99083	13994	5418	37232		
II. Process Losses								
A. Area Sources								
B. Pt. Sources		55295	2854	76975	1114	81		
III. Solid Waste Disposal								
A. Incineration								
1. On-Site	a. Area Source							
	b. Pt. Source							
2. Munic., etc.-	Pt. Source	3633	0	10537	854	427	36849	Tons
B. Open Burning								
1. On-Site	a. Area Source	2274	142	12079	4263	853	284207	Tons
	b. Pt. Source							
2. Dumps	a. Area Source							
	b. Pt. Source							
C. Other	a. Area Source							
	b. Pt. Source							
D. Total Solid Waste Disposal		5907	142	22616	5117	1280		
IV. Transportation - Area Source								
A. Mot. Vehicles	1. Gasoline	646	392	204695	28549	19330	156704	1000 Gl
	2. Diesel	279	502	3622	724	3789	22290	1000 Gl
B. Off-Highway Fuel Usage								
C. Aircraft								
D. Railroad		131	341	367	262	394	10498	1000 Gl
E. Vessels		6	18	16	12	18	497	1000 Gl
F. Gas. Evap. Losses		0	0	0	1567	0	156704	1000 Gl
G. Other (Solvent Evap.)		0	0	0	5370	0	5370	1000 Gl
H. Total Transportation		1062	1253	208700	36484	24131		
V. Misc. - Area Sources								
A. Agricultural Burning								
B. Other								
C. Total Misc.								
VI. Grand Total								
A. Area Source		33672	37174	233611	45686	38557		
B. Pt. Source		107339	66158	88674	1536	22314		
C. Total		141011	103332	322285	47222	61871		

For the State of Minnesota 139 Air Quality Control Region

Data Representative of Calendar Year 1970

SOURCE CATEGORY		Tons of Pollutant/Year					Fuel, Etc.	
		Part	SO_2	CO	HC	NO_x	Quantity	Units
I. Fuel Combustion								
A. Res. Fuel-Area Source								
1. (Anthracite) Coal		77	566	331	79	33	13230	Tons
2. Distillate Oil		94	677	47	28	113	18794	1000 Gl
3. Natural Gas		4	0	4	2	14	377	MMCF
4. Wood								
5. Other								
6. Total		175	1243	382	109	160		
B. Comm.-Inst. & Ind.								
1. (Bit.) Coal	a. Area Source	266	319	398	95	47	16820	Tons
	b. Pt. Source	3444	544	72	36	537	71605	Tons
2. Coke - Pt. Source								
3. Dis. Oil	a. Area Source	6	28	0	1	24	773	1000 Gl
	b. Pt. Source							
4. Res. Oil	a. Area Source	24	470	0	3	65	2153	1000 Gl
	b. Pt. Source							
5. Nat. Gas	a. Area Source	7	0	2	13	58	753	MMCF
	b. Pt. Source							
6. Proc. Gas - Pt. Source								
7. Wood	a. Area Source							
	b. Pt. Source							
8. Other	a. Area Source							
	b. Pt. Source							
9. Total		3747	1361	472	148	731		
C. Electric Plant								
1. Anthracite Coal								
2. Bituminous Coal		317	65	3	1	51	5663	Tons
3. Distillate Oil								
4. Residual Oil		0	4	0	0	1	19	1000 Gl
5. Natural Gas		0	0	0	0	4	23	MMCF
6. Other								
7. Total		317	69	3	1	56		
D. Total Fuel Combustion		4239	2673	857	258	947		
II. Process Losses								
A. Area Sources								
B. Pt. Sources		1547	0	0	0	0		
III. Solid Waste Disposal								
A. Incineration								

	b. Pt. Source							
9. Total		3747	1361	472	148	731		
C. Electric Plant								
1. Anthracite Coal								
2. Bituminous Coal		317	65	3	1	51	5663	Tons
3. Distillate Oil								
4. Residual Oil		0	4	0	0	1	19	1000 Gl
5. Natural Gas		0	0	0	0	4	23	MMCF
6. Other								
7. Total		317	69	3	1	56		
D. Total Fuel Combustion		4239	2673	857	258	947		
II. Process Losses								
A. Area Sources								
B. Pt. Sources		1547	0	0	0	0		
III. Solid Waste Disposal								
A. Incineration								
1. On-Site	a. Area Source							
	b. Pt. Source							
2. Munic., etc.- Pt. Source								
B. Open Burning								
1. On-Site	a. Area Source	292	18	1552	548	110	36518	Tons
	b. Pt. Source							
2. Dumps	a. Area Source							
	b. Pt. Source							
C. Other	a. Area Source							
	b. Pt. Source							
D. Total Solid Waste Disposal		292	18	1552	548	110		
IV. Transportation - Area Source								
A. Mot. Vehicles 1. Gasoline		142	86	44918	6265	4374	34387	1000 Gl
2. Diesel		27	48	347	69	363	2136	1000 Gl
B. Off-Highway Fuel Usage								
C. Aircraft								
D. Railroad		5	13	14	10	15	391	1000 Gl
E. Vessels								
F. Gas. Evap. Losses		0	0	0	344	0	34387	1000 Gl
G. Other (Solvent Evap.)		0	0	0	690	0	690	1000 Gl
H. Total Transportation		174	147	45279	6358	4752		
V. Misc. - Area Sources								
A. Agricultural Burning								
B. Other								
C. Total Misc.								
VI. Grand Total								
A. Area Source		944	2225	47215	7127	5216		
B. Pt. Source		5308	613	75	37	593		
C. Total		6252	2838	47290	7164	5809		

For the State of Minnesota — 131 Air Quality Control Region

Data Representative of Calendar Year 1970

SOURCE CATEGORY	Tons of Pollutant/Year					Fuel, Etc.	
	Part	SO_2	CO	HC	NO_x	Quantity	Units
I. Fuel Combustion							
A. Res. Fuel-Area Source							
1. (Anthracite) Coal	191	1408	823	198	82	32933	Tons
2. Distillate Oil	524	3771	262	157	629	104762	1000 G
3. Natural Gas	817	26	860	344	3224	85968	MMCF
4. Wood							
5. Other							
6. Total	1532	5205	1945	699	3935		
B. Comm.-Inst. & Ind.							
1. (Bit.) Coal a. Area Source	1005	1708	559	139	191	39969	Tons
b. Pt. Source	4961	5676	79	28	1210	137806	Tons
2. Coke - Pt. Source							
3. Dis. Oil a. Area Source	510	2447	7	102	2039	67972	1000 G
b. Pt. Source	4	22	0	0	17	584	1000 G
4. Res. Oil a. Area Source	65571	754	14335	7	98	1967	1000 G
b. Pt. Source	200	3456	1	26	522	17388	1000 G
5. Nat. Gas a. Area Source	741	25	173	1373	6327	81459	MMCF
b. Pt. Source	114	3	43	192	919	12847	MMCF
6. Proc. Gas - Pt. Source							
7. Wood a. Area Source							
b. Pt. Source							
8. Other a. Area Source							
b. Pt. Source							
9. Total	73106	14091	15197	1867	11323		
C. Electric Plant							
1. Anthracite Coal							
2. Bituminous Coal	38424	202022	1725	517	56643	3448689	Tons
3. Distillate Oil	89	289	2	20	390	13016	1000 G
4. Residual Oil	6	152	0	1	16	548	1000 G
5. Natural Gas	785	38	25	2488	24258	128527	MMCF
6. Other							
7. Total	39304	202501	1752	3026	81307	3590780	
D. Total Fuel Combustion	113942	221797	18894	5592	96565	4174435	
II. Process Losses							
A. Area Sources							
B. Pt. Sources							
III. Solid Waste Disposal	19682	23646	9601	25260	82		
A. Incineration							

	b. Pt. Source							
9. Total		73106	14091	15197	1867	11323		
C. Electric Plant								
1. Anthracite Coal								
2. Bituminous Coal		38424	202022	1725	517	56643	3448689	Tons
3. Distillate Oil		89	289	2	20	390	13016	1000 G
4. Residual Oil		6	152	0	1	16	548	1000 G
5. Natural Gas		785	38	25	2488	24258	128527	MMCF
6. Other								
7. Total		39304	202501	1752	3026	81307	3590780	
D. Total Fuel Combustion		113942	221797	18894	5592	96565	4174435	
II. Process Losses								
A. Area Sources								
B. Pt. Sources		19682	23646	9601	25260	82		
III. Solid Waste Disposal								
A. Incineration								
1. On-Site	a. Area Source							
	b. Pt. Source							
2. Munic., etc.- Pt. Source		2545	201	700	295	329	239400	Tons
B. Open Burning								
1. On-Site	a. Area Source	2951	184	15680	5534	1107	368937	Tons
	b. Pt. Source							
2. Dumps	a. Area Source							
	b. Pt. Source							
C. Other	a. Area Source							
	b. Pt. Source							
D. Total Solid Waste Disposal		5496	385	22680	5829	1436	608337	
IV. Transportation - Area Source								
A. Mot. Vehicles 1. Gasoline		3380	2048	1351924	180257	95761	819348	1000 G
2. Diesel		1988	3579	25849	5170	27042	159071	1000 G
B. Off-Highway Fuel Usage								
C. Aircraft		2621	1297	56152	12978	1260		
D. Railroad		585	1521	1638	1170	1754	40786	1000 G
E. Vessels		2270	28	82	74	57	83	1000 G
F. Gas. Evap. Losses		0	0	0	9832	0	819348	1000 G
G. Other (Solvent Evap.)		0	0	0	22880	0	22880	Tons
H. Total Transportation		10844	8473	1435645	232361	125874		
V. Misc. - Area Sources								
A. Agricultural Burning								
B. Other								
C. Total Misc.								
VI. Grand Total								
A. Area Source		83154	18796	1468344	240215	139571		
B. Pt. Source		66810	235505	12176	28827	84386		
C. Total		149964	254301	1480520	269042	223957		

For the State of Minnesota

Data Representative of Calendar Year 1970

132 Air Quality Control Region

SOURCE CATEGORY	Tons of Pollutant/Year					Fuel, Etc.	
	Part	SO_2	CO	HC	NO_x	Quantity	Units
I. Fuel Combustion							
A. Res. Fuel-Area Source							
1. (Anthracite) Coal	1074	7918	2631	1111	463	185223	Tons
2. Distillate Oil	824	5931	412	247	989	164753	1000 Gl
3. Natural Gas	26	1	27	11	102	2728	MMCF
4. Wood	64816	3601	4801	4801	24006	4801196	Tons
5. Other							
6. Total	66740	17451	9871	6170	25560		
B. Comm.-Inst. & Ind.							
1. (Bit.) Coal a. Area Source	7237	13474	5120	1258	1363	315190	Tons
b. Pt. Source	5645	1959	93	35	1271	147635	Tons
2. Coke - Pt. Source							
3. Dis. Oil a. Area Source	21	101	0	4	84	2794	1000 Gl
b. Pt. Source							
4. Res. Oil a. Area Source	120	2276	1	16	312	10411	1000 Gl
b. Pt. Source	15	287	0	2	40	1356	1000 Gl
5. Nat. Gas a. Area Source							
b. Pt. Source	5	0	0	23	102	1173	MMCF
6. Proc. Gas - Pt. Source							
7. Wood a. Area Source							
b. Pt. Source							
8. Other a. Area Source							
b. Pt. Source							
9. Total	13043	18097	5214	1338	3172		
C. Electric Plant							
1. Anthracite Coal							
2. Bituminous Coal	14031	13405	836	413	6516	859315	Tons
3. Distillate Oil							
4. Residual Oil	4	114	0	1	11	358	1000 Gl
5. Natural Gas	2	0	0	5	49	250	MMCF
6. Other							
7. Total	14037	13519	836	419	6576		
D. Total Fuel Combustion	93820	49067	15921	7927	35308		
II. Process Losses							
A. Area Sources							
B. Pt. Sources	44445	0	0	682	0		
III. Solid Waste Disposal							
A. Incineration							
1. On-Site a. Area Source							
b. Pt. Source							
2. Munic., etc.- Pt. Source							
B. Open Burning							
1. On-Site							

	b. Pt. Source							
9. Total		13043	18097	5214	1338	3172		
C. Electric Plant								
1. Anthracite Coal								
2. Bituminous Coal		14031	13405	836	413	6516	859315	Tons
3. Distillate Oil								
4. Residual Oil		4	114	0	1	11	358	1000 Gl
5. Natural Gas		2	0	0	5	49	250	MMCF
6. Other								
7. Total		14037	13519	836	419	6576		
D. Total Fuel Combustion		93820	49067	15921	7927	35308		
II. Process Losses								
A. Area Sources								
B. Pt. Sources		44445	0	0	682	0		
III. Solid Waste Disposal								
A. Incineration								
1. On-Site	a. Area Source							
	b. Pt. Source							
2. Munic., etc.- Pt. Source								
B. Open Burning								
1. On-Site	a. Area Source	3753	235	19940	7038	1408	469180	Tons
	b. Pt. Source							
2. Dumps	a. Area Source							
	b. Pt. Source							
C. Other	a. Area Source							
	b. Pt. Source							
D. Total Solid Waste Disposal		3753	235	19940	7038	1408	469180	Tons
IV. Transportation - Area Source								
A. Mot. Vehicles	1. Gasoline	1012	614	320583	44712	31215	245422	1000 Gl
	2. Diesel	342	615	4442	888	4647	27333	1000 Gl
B. Off-Highway Fuel Usage								
C. Aircraft								
D. Railroad		125	324	349	249	374	9977	1000 Gl
E. Vessels								
F. Gas. Evap. Losses		0	0	0	2454	0	245422	1000 Gl
G. Other								
H. Total Transportation		1479	1553	325374	48303	36236		
V. Misc. - Area Sources								
A. Agricultural Burning								
B. Other								
C. Total Misc.								
VI. Grand Total								
A. Area Source		79350	35090	360306	62789	64963		
B. Pt. Source		64147	15765	929	1138	7989		
C. Total		143497	50855	361235	63927	72952		

For the State of Minnesota — 133 Air Quality Control Region

Data Representative of Calendar Year 1970

NOT REPRODUCIBLE

SOURCE CATEGORY	Tons of Pollutant/Year					Fuel, Etc.	
	Part	SO_2	CO	HC	NO_x	Quantity	Units
I. Fuel Combustion							
A. Res. Fuel-Area Source							
1. (Anthracite) Coal	660	4864	2845	683	284	113780	Tons
2. Distillate Oil	495	3563	247	148	594	98976	1000 Gl
3. Natural Gas	38	1	41	16	152	4051	MMCF
4. Wood	4939	274	366	366	1829	365851	Tons
5. Other							
6. Total	6132	8702	3499	1213	2859		
B. Comm.-Inst. & Ind.							
1. (Bit.) Coal a. Area Source	5975	11138	4240	1042	1125	260533	Tons
b. Pt. Source							
2. Coke - Pt. Source							
3. Dis. Oil a. Area Source	57	272	1	11	226	7540	1000 Gl
b. Pt. Source	6	29	0	1	24	800	1000 Gl
4. Res. Oil a. Area Source	263	5001	2	35	686	22877	1000 Gl
b. Pt. Source	16	293	0	2	43	1417	1000 Gl
5. Nat. Gas a. Area Source	63	2	17	114	531	6992	MMCF
b. Pt. Source	2	0	0	5	14	263	MMCF
6. Proc. Gas - Pt. Source							
7. Wood a. Area Source							
b. Pt. Source							
8. Other a. Area Source							
b. Pt. Source							
9. Total	6382	16735	4260	1210	2649		
C. Electric Plant							
1. Anthracite Coal							
2. Bituminous Coal	4578	4783	82	41	635	83840	Tons
3. Distillate Oil	5	22	0	1	18	600	1000 Gl
4. Residual Oil	6	40	0	1	15	500	1000 Gl
5. Natural Gas	5	0	0	21	212	1083	MMCF
6. Other							
7. Total	4594	4845	82	64	880		
D. Total Fuel Combustion	17108	30282	7841	2487	6388		
II. Process Losses							
A. Area Sources							
B. Pt. Sources	22406	0	0	24269	0		
III. Solid Waste Disposal							
A. Incineration							
1. On-Site a. Area Source							
b. Pt. Source							
2. Munic., etc.- Pt. Source	17	0	0	0	41	27498	Tons
B. Open Burning							
1. On-Site a. Area Source	1867	117	9919	3501	700	233200	Tons

C. Electric Plant								
1. Anthracite Coal								
2. Bituminous Coal	4578	4783	82	41	635	83840	Tons
3. Distillate Oil	5	22	0	1	18	600	1000 Gl
4. Residual Oil	6	40	0	1	15	500	1000 Gl
5. Natural Gas	5	0	0	21	212	1083	MMCF
6. Other							
7. Total	4594	4845	82	64	880		
D. Total Fuel Combustion	17108	30282	7841	2487	6388		
II. Process Losses							
A. Area Sources							
B. Pt. Sources	22406	0	0	24269	0		
III. Solid Waste Disposal							
A. Incineration							
1. On-Site a. Area Source							
b. Pt. Source							
2. Munic., etc.- Pt. Source	17	0	0	0	41	27498	Tons
B. Open Burning							
1. On-Site a. Area Source	1867	117	9919	3501	700	233399	Tons
b. Pt. Source							
2. Dumps a. Area Source							
b. Pt. Source							
C. Other a. Area Source							
b. Pt. Source							
D. Total Solid Waste Disposal	1884	117	9919	3501	741		
IV. Transportation - Area Source							
A. Mot. Vehicles 1. Gasoline	846	512	267743	37343	26070	204971	1000 Gl
2. Diesel	229	413	2982	596	3119	18349	1000 Gl
B. Off-Highway Fuel Usage							
C. Aircraft							
D. Railroad	90	235	253	181	271	7239	1000 Gl
E. Vessels							
F. Gas. Evap. Losses	0	0	0	2050	0	204971	1000 Gl
G. Other (Solvent Evap.)	0	0	0	4410	0	4410	1000 Gl
H. Total Transportation	1165	1160	270978	44580	29460		
V. Misc. - Area Sources							
A. Agricultural Burning							
B. Other							
C. Total Misc.							
VI. Grand Total							
A. Area Source	15522	26392	288656	50496	35587		
B. Pt. Source	27041	5167	82	24341	1002		
C. Total	42563	31559	288738	74837	36589		